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HULAH LAKE

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HISTORIC PRESERVATION ASSOCIATES REPORTS 87-23

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HULAH LAKE

Survey and Evaluation of Cultural Resources at Hulah Lake, Osage County, Oklahoma

by

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ABSTRACT

Cultural resources survey of approximately 1517 acres conducted along the shoreline and in extra shoreline areas of Hulah Lake, Osage County, Oklahoma resulted in the discovery of 22 new sites and the rediscovery of 3 previously recorded sites representing the results of prehistoric and/or historic activities. While none of the recorded sites is clearly eligible for the National Register of Historic Places, 5 prehistoric components require additional work to assess their individual significance.

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INTRODUCTION

BACKGROUND AND PURPOSE OF THE REPORT

In September 1984 the Tulsa District of the U. S. Army Corps of Engineers (COE) solicited proposals for an indefinite delivery contract for cultural resources services within district boundaries. This work was required pursuant to Corps responsibilities under the National Historic Preservation Act of 1966 (PL 89-665), the Archaeological and Historical Preservation Act of 1969 (PL 91-190) and the Advisory Council's "Procedure for the Protection of Historic and Cultural Properties" (36CFR800).

The Historic Preservation Associates (HPA) proposal was submitted on 21 September 1984 and Contract No. DACW56-85-D-0024 was awarded on 12 December 1984. Delivery Order No. 0005 for Phase I survey and preliminary evaluation of cultural resources located along the shoreline of Hulah Lake was issued on 3 June 1985. Delivery Order No. 0007 for additional Phase II survey and preliminary evaluation of cultural resources located in the extra shoreline areas of Hulah Lake was issued on 21 August 1985.

PROJECT LOCATION AND DESCRIPTION

Hulah Lake is located on the Caney River in extreme northern Osage County, Oklahoma and extends into southern Chautuaqua County, Kansas. The dam is located at river mile 96.2, two miles west of the former location of the town of Hulah, Oklahoma (Figure 1). Hulah was built along the new railroad. Its last standing structure was the railroad station that was moved to Bartlesville several years ago. Hulah is the Osage word for eagle.

Hulah Lake was authorized by Congress in 1936 as a multipurpose reservoir. Construction began in 1946 and was completed in 1951. The conservation pool is at an elevation of 733 feet amsl and stores 33,400 acre feet of water. There are 62 miles of shoreline at the top of the conservation pool. The flood control pool is at an elevation 765 feet amsl and stores 257,900 acre feet of water. There are 75 miles of shoreline at the top of the flood control pool. The watershed above the lake covers 732 square miles. Project lands total 20,676 acres.

Sample Units

Fourteen sample units were surveyed during the course of the fieldwork with seven each during Phase I and Phase II (Tables 1 and 2 and Figure 2). The data in Table 1 for miles of shoreline actually surveyed in each sample unit were derived from the USGS quadrangles while the acreage estimates were calculated using an average transect width of 50 feet. Estimates for the various soil acreages were measured from county soil survey maps (Bourlier et al. 1979). Acreage data contained in Table 2 were estimated from county soil survey maps using a dot grid. The figures for cultivated and vegetated (including forest and pasture) acreage were calculated using the fieldnotes and measuring acreages on the soil survey maps.

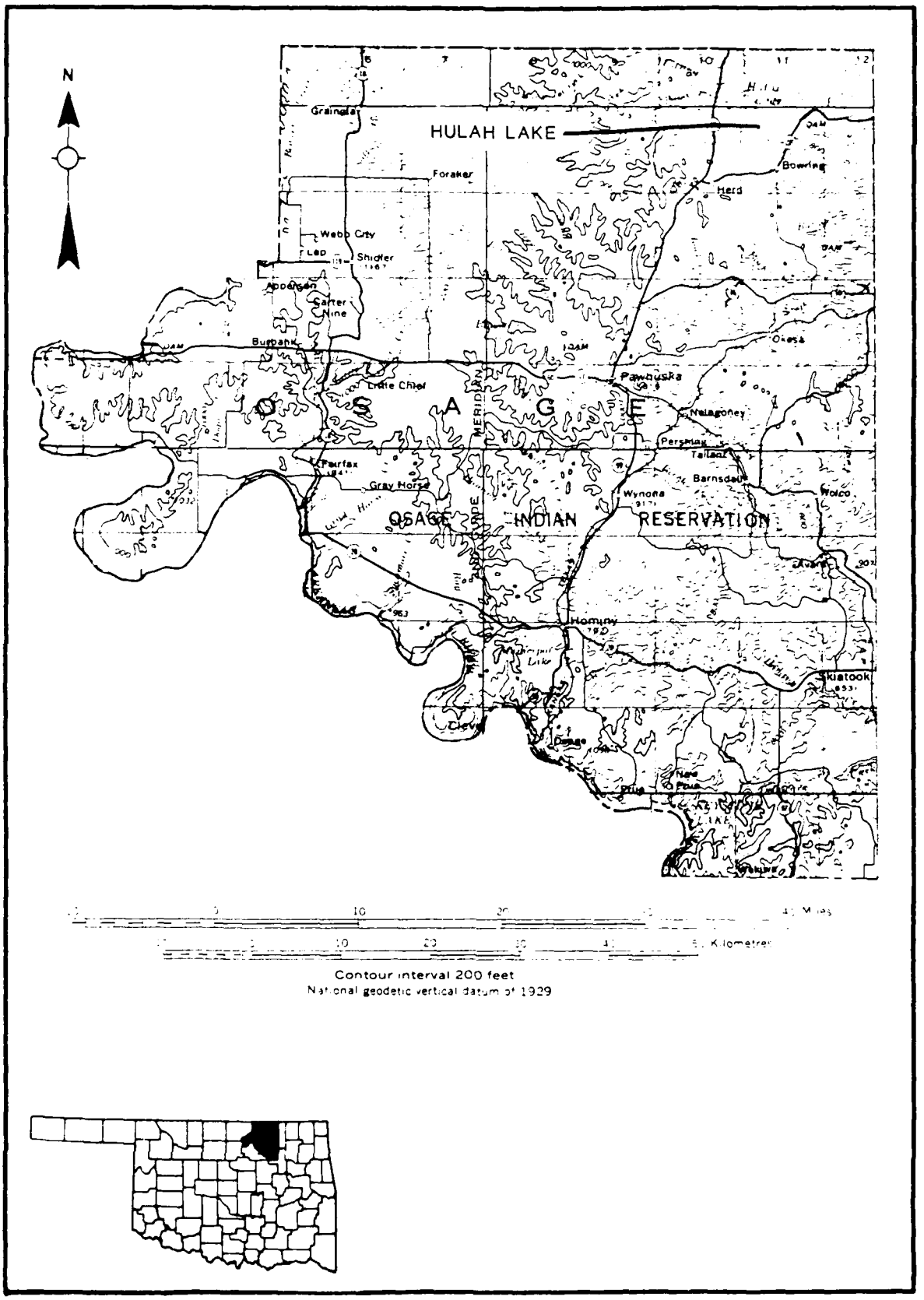

Figure 1. Project location.

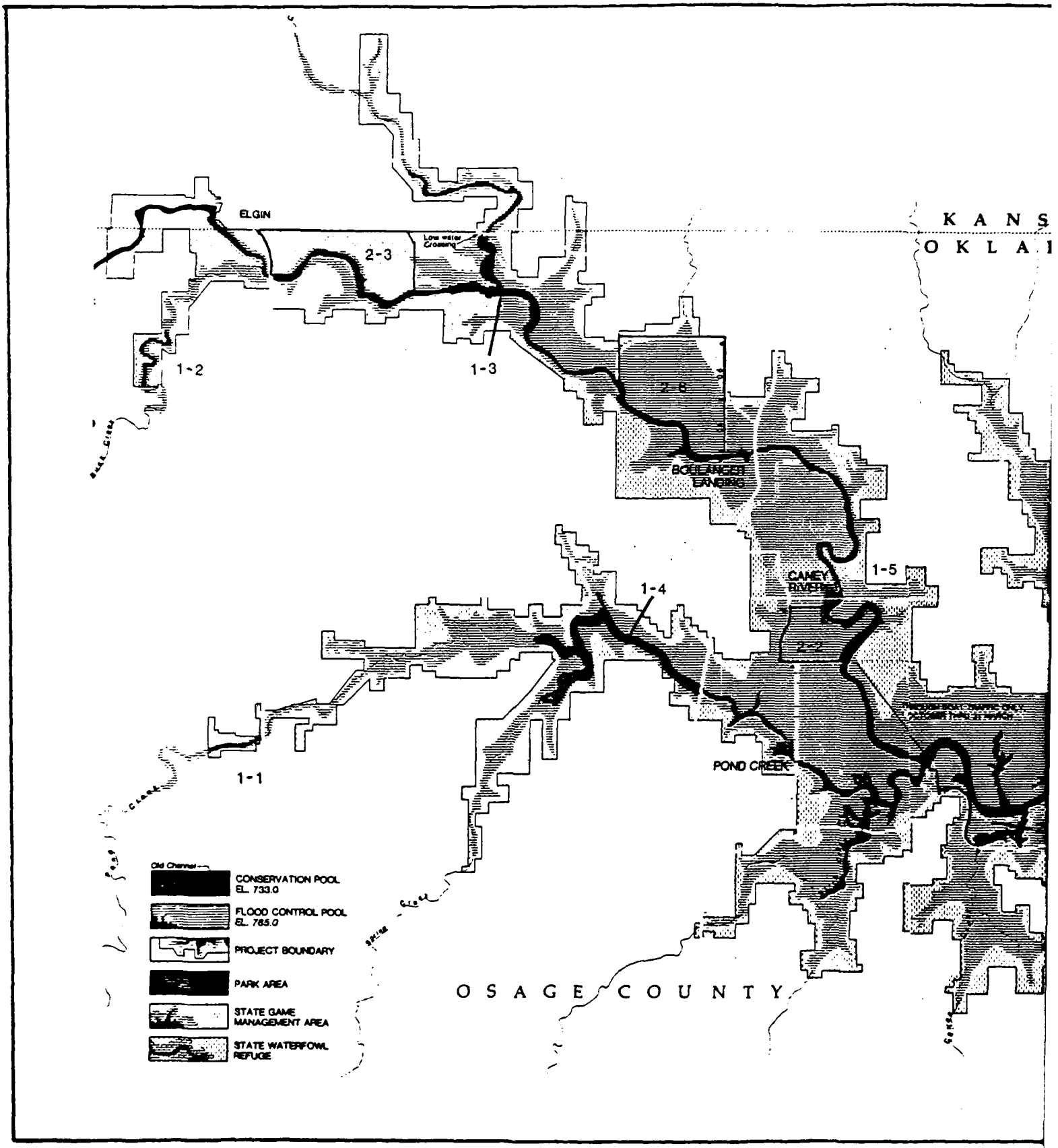

Figure 2. Location of the sample units.

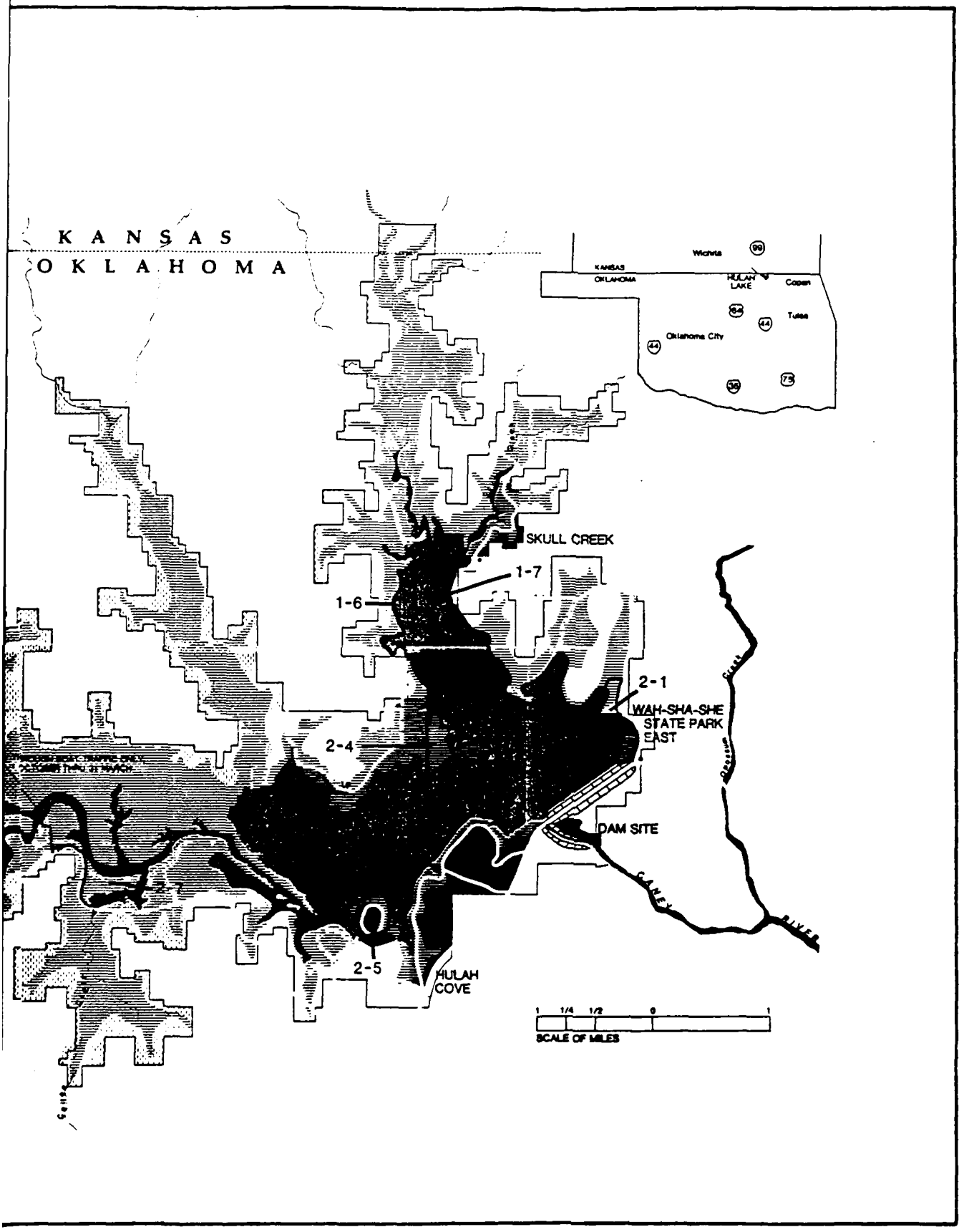
KANSAS
OKLAHOMA
KANSAS
OKLAHOMA
Wichita
HULAH LAKE
Coffeyville
Tulsa
Oklahoma City
SKULL CREEK
1-7
1-6
2-1
WAH-SHA-SHE STATE PARK EAST
2-4
DAM SITE
2-5
HULAH COVE
1 1/4 1/2 0 1
SCALE OF MILES

Table 1
Location and characteristics of sample units in Delivery Order No. 0005

Unit	Location	Miles/Acres	Soils (acres)	Topography	Plowed/Vegetated
1-1	West end Pond Creek, both sides. S1, T28N, R9E	1.06/6.42	Verdigris soils 1/ (6.42)	Floodplain	0/ 6.42
1-2	West end Buck Creek, both sides. S23, T29N, R9E	1.89/11.45	Verdigris soils 1/ (11.45)	Floodplain	0/11.45
1-3	Confl. Cedar Ck. & Caney R., both sides. S16 & 17, T29N, R10E	3.60/21.82	Verdigris soils 1/ (21.82)	Floodplain	0/21.82
1-4	Confl. Pond & Spring Cks. both sides. S3 & 4, T28N R10E & S33 & 34, T29N, R10E	5.68/34.42	Verdigris soils 1/ (33.73)	Floodplain	0/33.73
			Mason silt loam, 0-1% (0.15)	Floodplain	0/ 0.15
			Prue loam, 3-5% (0.54)	Upland slopes	0/ 0.54
1-5	West side Caney R., S36, T29N, R10E	0.95/5.76	Verdigris silt loam (5.76)	Floodplain	0/ 5.76
1-6	Tucker Cove, west side, S36, T29N, R11E	1.70/10.30	Darnell-Stephenville cpx, 1-8% (10.3)	Upland crests & slopes	0/10.30
1-7	East shore between Wah-Sha-She St. Park & Skull Ck. S27, 34 & 35, T29N, R11E	3.79/22.97	Coweta-Bates cpx, 1-8% (3.55)	Upland crests & slopes	0/ 3.55
			Dennis silt loam, 3-5% (0.93)	Upland slopes	0/ 0.93
			Niotaze-Darnell cpx, 15-25% (3.23)	Upland crests & slopes	0/ 3.23
			Norge, Dennis & Prue soils, gullied (0.39)	Uplands	0/ 0.39
			Parsons silt loam, 1-3% (1.81)	Upland valley	0/ 1.81
			Parsons-Carytown cpx, 0-3% (1.98)	Upland valley	0/ 1.98
			Prue loam, 3-5% (1.49)	Upland slopes	0/ 1.49
			Steedman silt loam, 3-5% (0.59)	Upland slopes	0/ 0.59
			Steedman-Coweta cpx, 3-15% (0.70)	Upland crests & slopes	0/ 0.70
			Steedman-Coweta cpx, 15-25% (6.93)	Upland crests & slopes	0/ 6.93
			Verdigris silt loam (0.66)	Floodplains	0/ 0.66
			Wynona silty clay loam, nearly level (0.71)	Floodplains	0/ 0.71
Total		18.67/113.14			0/113.14

PROJECT SPONSOR AND PARTICIPANTS

The sponsor for the work is the Tulsa District of the U. S. Army Corps of Engineers. The Contracting Officer for Delivery Order No. 0005 was Lieutenant Colonel N. J. Arens. The Contracting Officer for Delivery Order No. 0007 was Lieutenant Colonel Alan C. Smith. The Contracting Officer's Authorized Representative (COR) for both orders was Mr. Michael Corkran, an archeologist in the Environmental Section at the Tulsa District.

Timothy C. Klinger served as Principal Investigator for HPA. The fieldwork was conducted by Mr. David B. Board who also processed and analyzed the collections. The report was written by Mr. Klinger and Mr. Steven M. Imhoff with the assistance of Mr. Board.

SCOPE OF WORK

The full Scopes of Work (SOW) are reproduced in Appendix A. The two Delivery Orders for the Hula Lake project called for a preliminary evaluation of cultural resources with particular attention on the effects of near shore erosion on sites found there. While the sampling strategy was to be determined by HPA, the SOW called for shovel testing wherever surface visibility was limited and preliminary evaluations with recommendations concerning the need for further investigations. Based on the results of the investigation HPA was to provide a predictive model of site occurrence for the Hulah Lake project area.

Table 2

Location and characteristics of sample units in Delivery Order No. 0007

Unit	Location	Acres	Soils (acres)	Topography	Plowed/Vegetated
2-1	West side of lake. S35, T29N, R11E; S1, T28N, R11E	52.81	Steedman-Coweta cpx, 3-15% (14.95)	Upland crests & slopes	0.00/14.95
			Steedman-Coweta cpx, 15-25% (37.86)	Upland crests & slopes	0.00/37.86
2-2	West side Caney R. S35/36, T29N, R10E	208.24	Mason silt loam, 0-1% (122.56)	Floodplains	109.61/12.95
			Mason silt loam, 1-3% (9.96)	Floodplains	9.96/ 0.00
			Osage silty clay (23.91)	Floodplains	23.91/ 0.00
			Verdigris silt loam (27.90)	Floodplains	0.00/27.90
			Verdigris soils 1/ (23.91)	Floodplains	0.00/23.91
2-3	North side Caney R. S13, T29N, R9E & S18, T29N, R10E	320.84	Darnell-Stephenville cpx, 1-8% (0.50)	Upland crests & slopes	0.00/ 0.50
			Dennis silt loam, 1-3% (0.50)	Upland slopes	0.50/ 0.00
			Lightning silt loam (9.96)	Floodplains	3.98/ 5.98
			Mason silt loam, 0-1% (199.28)	Floodplains	152.45/46.83
			Mason silt loam, 1-3% (41.85)	Floodplains	3.99/37.86
			Verdigris silt loam (39.86)	Floodplains	0.00/39.86
			Verdigris soils 1/ (28.89)	Floodplains	0.00/28.89
2-4	West side of lake, Turkey Creek East; S2-3, T28N, R11E &S34, T29N, R11E	87.68	Coweta-Bates cpx, 1-8% (11.96)	Upland crests & slopes	0.00/11.96
			Dennis silt loam, 1-3% (34.87)	Upland slopes & valleys	0.00/34.87
			Dennis silt loam, 3-5% (14.94)	Upland slopes	0.00/14.94
			Norge silt loam, 1-3% (10.96)	Upland crests & slopes	0.00/10.96
			Norge silt loam, 3-5% (11.96)	Upland slopes	0.00/11.96
			Steedman-Coweta cpx, 3-15% (2.99)	Upland crests & slopes	0.00/ 2.99
2-5	South side lake, Caney Bend PUA, S9-10, T28N, R11E	65.76	Darnell-Stephenville cpx, (37.86) 1-8%	Upland crests & slopes	0.00/37.86
			Dennis silt loam, 3-5% (1.00)	Upland slopes	0.00/ 1.00
			Niotaze-Darnell cpx, 15-25% (17.94)	Upland crests & slopes	0.00/17.94
			Steedman-Coweta cpx, 15-25% (1.99)	Upland crests & slopes	0.00/ 1.99
			Stephenville-Darnell cpx, (6.97) 1-5%	Upland crests & slopes	0.00/ 6.97
2-6	North side of Caney R. S22 & 27, T29N, R10E	528.10	Bates loam, 1-3% (18.93)	Upland crests & slopes	18.93/ 0.00
			Cleora fine sandy loam (13.95)	Floodplains	7.00/ 6.95
			Dennis-Carytown cpx, 1-5% (66.76)	Upland slopes & valleys	48.83/17.93
			Mason silt loam 0-1% (235.15)	Floodplains	217.22/17.93
			Mason silt loam 1-3% (21.92)	Floodplains	10.96/10.96
			Niotaze-Darnell cpx, 15-25% (2.99)	Upland crests & slopes	0.00/ 2.99
			Niotaze-Darnell cpx, 25-45% (1.00)	Upland crests & slopes	0.00/ 1.00
			Osage silty clay (44.84)	Floodplains	33.88/10.96
			Prue loam, 3-5% (2.99)	Upland crests & slopes	0.00/ 2.99
			Steedman-Coweta cpx, 15-25% (1.99)	Upland crests & slopes	0.00/ 1.99
			Verdigris silt loam (74.73)	Floodplains	6.97/67.76
			Verdigris soils 1/ (39.86)	Floodplains	0.00/39.86
			Wynona silty clay loam (2.99)	Floodplains	2.99/ 0.00
2-7	South side Caney R. S6-8, T28N, R11E	140.49	Darnell-Stephenville cpx, (15.94) 1-8%	Upland crests & slopes	14.94/ 1.00
			Mason silt loam 0-1% (62.77)	Floodplains	35.87/26.90
			Osage silty clay (24.91)	Floodplains	24.91/ 0.00
			Prue loam, 3-5% (1.99)	Upland crests & slopes	1.99/ 0.00
			Steedman-Coweta cpx, 15-25% (1.00)	Upland crests & slopes	1.00/ 0.00
			Stephenville-Darnell cpx, (33.88) 1-5%	Upland crests & slopes	0.00/33.88
Total		1403.92			729.89/674.03

MANAGEMENT AND RESEARCH OBJECTIVES

It is clear that the chief need of the Tulsa District is for basic information that will enable them to locate and effectively manage the cultural resources at Hulah Lake. HPA's primary objective was to locate sites, collect basic data (i.e., location, size, cultural affiliation, function, etc.) about each and develop recommendations regarding how they should be managed (i.e., tested, preserved in place, nominated to the National Register, etc.). Because only a sample of government lands was investigated, a second goal was to use the data gathered to provide initial information about the potential number and distribution of sites in portions of the project not surveyed.

Hulah Lake is situated in Region 2 of Oklahoma -- Mixed Grass-Tall Grass Prairie -- as outlined by Wyckoff and Brooks (1983:34-45). This region primarily encompasses western Oklahoma but the easternmost portion (located in Osage and Washington counties) lies in the Osage Savannah biotic district on the boundary between the prairie and the oak-hickory forest. Research goals for regions 2, 3 and 5 relate to the Hulah location.

Limited archeological work has been undertaken in Region 2 and prior to these investigations only one systematic survey in 1947 by Charles E. Smith and David J. Wenner (Bell 1949:305) had been completed of Hulah Lake. The research objectives upon which we focused were necessarily general because little was known about the project area and only a small portion of it was to be investigated. Wyckoff and Brooks (1983:259, 261, 265-266, 270-272) offer a number of research questions regarding technological, historical, behavioral and ecological problems. All have the potential to provide guidance in assessing the data potential of individual sites. A number of these are useful for the Hulah Lake area but only a few may be appropriate for the kinds of data collected during a survey. The known cultural sequence in the Hulah Lake area is limited to temporary sites dating to the Archaic, Woodland and Village Periods. No evidence of Paleo-Indian Period occupation has been recovered from the project area. Based on the results of the survey those research questions which apply to the current project include:

Archaic Period Are specific projectile points and tool kits associated with specific parts of this period or with specific cultural groups? Are particular projectile points and assemblages related to cultural groups and can these groups be differentiated? What was the nature of Archaic settlement and subsistence activities and did they change through time or between groups? How the did environment change between 8000 and 2000 years ago and how did Archaic peoples adapt? Is there evidence of a drier climate between 7000 and 4000 B.P. and how did Archaic peoples adapt? Is there evidence of plant domestication?

Woodland Period What kinds of lithic technologies and tool kits are there? What purpose did bifaces with polished bits serve? Is there evidence of the Woodland complexes known from other regions? Are specific artifacts and tool kits associated with specific cultural groups? Are Woodland groups descended from prior Archaic groups, or did they originate elsewhere? Did people using Woodland assemblages persist to A.D. 1000 or later? Did local Woodland peoples adopt items from cultural groups from both the eastern woodlands and plains? Did local Woodland groups participate in

trade and ceremonial networks documented elsewhere? What was the environment like and how did Woodland peoples adapt to it? Were Woodland settlements inhabited on a permanent basis? Was horticulture practiced?

Prehistoric Village Period Are there chronologically or culturally distinct artifact assemblages? Are there links between Prehistoric Village peoples and prior Woodland groups? What cultural phases identified in regions 2, 3 and 5 are represented in the project area?

DATES OF THE INVESTIGATIONS

Phase I (DO-0005) investigations were initiated on 21 February 1986 and were completed on 1 March 1986. Seven sample units selected prior to the commencement of fieldwork were surveyed (unit 1 on 21 February; unit 2 on 21 and 22 February; unit 7 on 23 and 24 February; unit 6 on 25 February; unit 4 on 25 and 26 February; unit 5 on 27 February; and unit 3 on 28 February and 1 March). Phase II (DO-0007) investigations were initiated on 8 March 1986 and were completed on 9 May 1986. Seven sample units selected prior to the commencement of fieldwork were surveyed (unit 1 on 8 March; unit 2 on 9 through 11 and 30 March; unit 5 on 12 and 13 March; unit 3 on 13 through 15, 27 through 29 March and 1 April; unit 4 on 30 and 31 March; unit 6 on 1, 12 through 13, 15 and 16 and 18 through 24 April; and unit 7 on 7 and 9 May).

PREVIOUS INVESTIGATIONS

Prior to the HPA investigations, 512 archeological sites were on record for Osage County. Wyckoff and Brooks (1983:34-35) note many of the professional and amateur projects that have been conducted in Osage County. Between 1930 and 1952 the investigations Osage County were primarily limited to unreported collecting by amateurs though in 1947 University of Oklahoma archeologists Charles E. Smith and David J. Wenner surveyed the proposed Hulah Reservoir (Bell 1949:305). Four prehistoric temporary camps were found but none had associated diagnostic artifacts. A similar survey of the proposed Keystone Reservoir in the 1950s recorded 84 sites and 24 potential sites. In 1963-1964, with the assistance of an archeologist from the Oklahoma River Basin Survey, volunteers from the Kay County Chapter of the Oklahoma Anthropological Society surveyed the proposed Kaw Reservoir and recorded 101 sites (Wyckoff 1964). Between 1967-1975 the Oklahoma River Basin Survey tested 29 Kaw Reservoir sites (Bastian 1969; Hartley 1975; Rohrbaugh 1973). Archeological Research Associates of Tulsa, Oklahoma surveyed the proposed eastern Osage County Candy Reservoir in 1976 and in 1979 tested three of the six recorded sites (Saunders 1980). In 1980 Archeological Research Associates (Moore 1980) conducted a survey along the shore of Lake Keystone that resulted in the discovery of 83 historic and 198 prehistoric sites being affected by shoreline erosion. Surveys at Shidler (Neal 1973), Birch Creek (Barr 1965) and Skiatook (Rohrbaugh and Wyckoff 1969; Gettys et.al. 1976) reservoirs have been conducted by the Oklahoma River Basin Survey. Birch Creek and Skiatook were also inspected by Gregory Perino (1972a, 1972b) of the Gilcrease Institute. Between 1975-1980 archeologists from the University of Tulsa and the University of Oklahoma tested 20 of the sites in the Shidler, Birch Creek and Skiatook reservoirs (Henry 1977a, 1977b, 1978, 1982, n.d.).

As part of various projects of the Soil Conservation Service archeologists for the Oklahoma Conservation Commission and the Oklahoma Archeological Survey have investigated the Cotton-Coon-Mission creek (Wallis 1986) and the Sand-Hogshooter creek (Bobalik 1975) drainages. As part of an archeological field school, Oklahoma State University tested small mounds and a campsite in Osage and Washington counties. Added to this is the work conducted in connection with Copan Reservoir along the Caney River (Henry 1976; Kay 1981; Keyser and Farley 1979; Prewitt 1980; Reid and Artz 1984), additional work at Kaw Lake (Galm 1979; George 1982; Vehik and Flynn 1982; Vehik and Ashworth 1983) and surveys of the Bird (Drass 1985), Beaver (Vehik 1985a) and Salt (Kirby and Justen 1983; Vehik 1985a) creek basins.

NATURAL ENVIRONMENT

Hulah Lake is located in the Eastern Sandstone Cuesta Plains geomorphic province that is characterized by Pennsylvanian sandstones forming hills or ridges having a steep front face and a gently sloping back side that overlook broad shale plains (Curtis and Ham 1979). Surface geology includes the Tallant and Vamoosa formations on the uplands and alluvium on the Caney River floodplain (Miser 1954; Tanner 1956). The Tallant Formation includes Bigheart and Revard sandstones and two unnamed greenish-gray and grayish-blue shales (Tanner 1956:32). The Vamoosa Formation includes sandstone, chert conglomerate and red and green shales (Tanner 1956:39, 41).

No lithologies suitable for the manufacture of chipped stone tools occur in the project vicinity. The nearest source of such stone that was extensively used during the prehistoric period is located at the Kay County quarries about 32 miles west of the project (Banks 1984:75-79; Miser 1954). These chert producing formations are the southern portion of the Flint Hills Cuesta of Kansas (Banks 1984:75). The Kay County chert, more recently termed Florence-A chert (Vehik 1985a:1), has been described as exhibiting "colors in varying shades from grayish pink to brick red" though the "reddish coloration and sheen that are typical of archaeological specimens were produced by intentional heat treatment [and that] the unique characteristic of the Kay County chert...is the natural configuration of available nodules...[that] occurs as lenticular nodules as much as 38 cm in length, 8 cm thick, and 25 cm in width (Banks 1984:77)."

Other types of chert exist in the general project area but were seldom used (Vehik 1985a:1, 6). A second variety of the Kay County chert (Florence-B) is a dark bluish-gray that, like two other more recently identified varieties (Florence-C and D) were not extensively used. Werford chert, located primarily in Kansas but extending down into the general project area, was seldom used in northern Oklahoma due to the lesser quality of the Werford material found in Oklahoma. Neva and Foraker cherts are found in the gravels in local streams and formations but no quarries are known and few archeological examples have been documented.

East of the project area the Oologah limestone produces a poor quality chert that, while used in the immediate area of the formations, was not widely distributed (Banks 1984:78). Other cherts in the region do not appear to have been widely used though the inhabitants of the area would have had resources to the east (in the Ozarks) and to the north (in Kansas) available to them as well as more exotic chert types available through various trade routes.

The general soil associations shown in Figure 3 have been grouped into those on wooded floodplains, prairie uplands and wooded uplands. A comparison

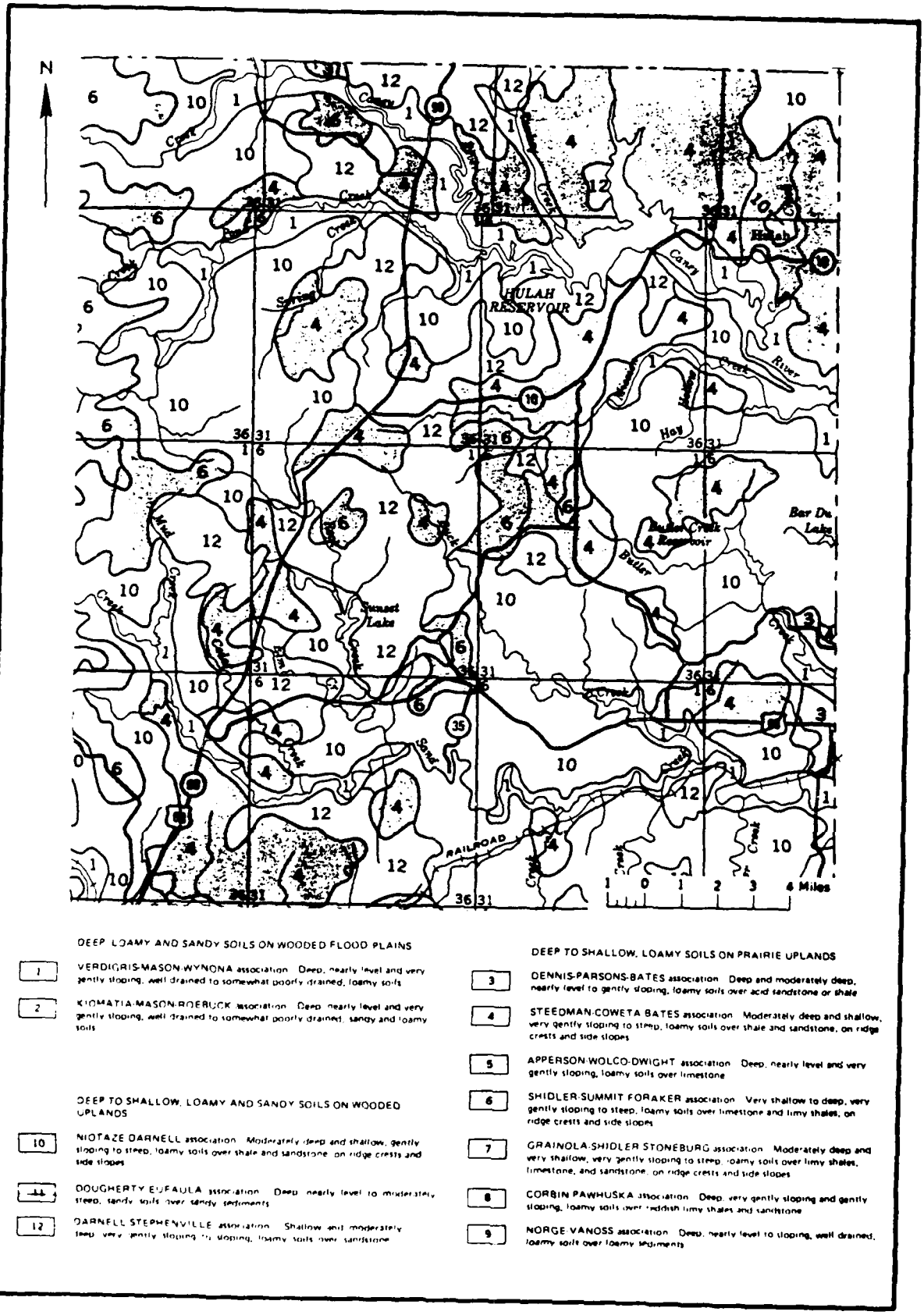

Figure 3. Soil associations in the project area.

of the soils distribution with the geologic map (Miser 1954) shows that the upland prairie soils developed over the Vamoosa Formation while the wooded upland soils formed over the Tallant Formation. Specific soil types crossed by the survey are presented in Table 3 along with selected characteristics, natural vegetation, acreage and the number of sites associated with each.

Hulah Lake is situated in the oak-hickory savannah that is a transitional zone between the eastern woodlands and the southern plains (Blair and Hubbel 1938:433-435; Bruner 1931:103, 142-148; see also Wyckoff 1984). Blair (1939:93) documents four principal plant associations including dry scrubby forest on sandstone hills and escarpments, a more mesic type of vegetation on protected or north-facing sandstone bluffs, streams filled with aquatic mosses near their headwaters in the hills and grassland communities on the level or rolling areas of shale soils.

The climate of Osage County is characterized by cold winters and hot summers. Average winter temperature is 38° F with an average daily minimum of 26°. The first fall freeze normally occurs prior to October 8 and the last spring freeze not later than April 30 with a growing season of 172 days. The average summer temperature is 80° with an average daily maximum of 92°. Recorded extremes are -13° and 114°. Most of the annual precipitation occurs in the form of rain, that is heaviest in the spring and early summer. Average annual precipitation is 34.54 inches, including about 10 inches of snow. January is the driest month with an average of .99 inches of precipitation while September is the wettest with an average of 4.5 inches (Bourlier 1979:1-2, 82-83).

CULTURAL ENVIRONMENT

PREHISTORIC SEQUENCE

Discussions of Oklahoma prehistory relevant to the project are presented in Bell (1984), Brooks and Drass (1984), Drass (1985:15-25) and Wyckoff and Brooks (1983:12-19). Table 4 presents a generalized prehistoric sequence for Oklahoma derived from Wyckoff and Brooks (1983:13). Of the listed periods only Archaic, Woodland and Village period sites are represented in Osage County.

While few data are available concerning the prehistory of Osage County, it is possible to discuss the general cultural sequence based on information drawn from a wider area. There is no information on record concerning Paleo-Indian sites in the project vicinity though Bell (1971) reports that an isolated Clovis point has been reported from Osage County. Wyckoff and Brooks (1983:12) suggest that the cultures of the Paleo-Indian Period were organized into "nomadic or semi-nomadic small groups who hunted large and small game and gathered edible wild plants..." The best data for the vicinity relating to the early prehistoric period comes from Mayes County where cultural evidence dated to 7456 B.C. ±193 was recovered from 3 m below the surface at the Packard site (Wyckoff 1964:103).

During the Archaic Period groups using this region of Oklahoma exploited the local environment in a seasonal round of base camps and various temporary resource extraction camps. The mammoths and other mega-fauna that were hunted by Paleo-Indians were no longer available and the general evidence indicates a shift toward a more localized hunting and gathering economy. Evidence of Archaic Period sites has been recovered at Kaw and Skiatook reservoirs located west and south of the current project and at sites such as Shetley Shelter,

Table 3
Characteristics of soils present in the sample units

Soil (mapping unit)	Texture	% Slope	Topography	Vegetation	Drainage	Flooding Frequency	Depth to Water Table	Acres	Sites P	H	T
Bates (4)	Loam	1-3	Upland crests & slopes	Prairie uplands	Well	None	¢1.83 m	18.93	0	0	0
Cleora (8)	Fine sandy loam	▂ 1	Floodplains	Wooded bottomlands	Well	Occasional	¢1.83 m	13.95	0	0	0
Coweta-Bates complex (13)								15.51	1	2	2
Bates portion (20%)	Loam	1-3	Upland crests & slopes	Prairie uplands	Well	None	¢1.83 m				
Coweta portion (45%)	Loam	3-8	Upland crests & slopes	Prairie uplands	Well-SW excess.	None	¢1.83 m				
Darnell-Stephenville complex (14)								64.60	0	0	0
Darnell portion (50%)	Fine sandy loam	3-8	Upland crests & slopes	Wooded uplands	Well-SW excess.	None	¢1.83 m				
Stephenville portion (20%)	Fine sandy loam	1-3	Upland crests & slopes	Wooded uplands	Well	None	¢1.83 m				
Dennis (15)	Silt loam	1-3	Upland slopes	Prairie uplands	Moderately well	None	0.61-0.91 m	35.37	0	0	0
Dennis (16)	Silt loam	3-5	Upland slopes	Prairie uplands	Moderately well	None	0.61-0.91 m	16.87	1	0	1
Dennis-Carytown complex (17)								66.76	0	1	1
Dennis portion (30%)	Silt loam	3-5	Upland slopes	Prairie uplands	Moderately well	None	0.61-0.91 m				
Carytown portion (20%)	Silt loam	1-3	Upland valleys	Prairie uplands	Poor	None	0.00-0.30 m				
Lightning (29)	Silt loam	▂ 1	Floodplains	Wooded bottomlands	Somewhat poor	Occasional	0.00-0.61 m	9.96	0	0	0
Mason (31)	Silt loam	0-1	Floodplains	Wooded bottomlands	Well-Mod. well	Rare	¢1.83 m	619.91	10	5	13
Mason (32)	Silt loam	1-3	Floodplains	Wooded bottomlands	Well-Mod. well	Rare	¢1.83 m	73.73	0	0	0
Niotaze-Darnell complex (36)								24.16	0	0	0
Niotaze portion (60%)	Loam	20-25	Upland crests & slopes	Wooded uplands	Somewhat poor	None	0.30-0.61 m				
Darnell portion (15%)	Fine sandy loam	15-20	Upland crests & slopes	Wooded uplands	Well-SW excess.	None	¢1.83 m				
Niotaze-Darnell complex (37)								1.00	0	0	0
Niotaze portion (35%)	Loam	35-45	Upland crests & slopes	Wooded uplands	Somewhat poor	None	0.30-0.61 m				
Darnell portion (20%)	Fine sandy loam	25-35	Upland crests & slopes	Wooded uplands	Well-SW excess.	None	¢1.83 m				
Norge (38)	Silt loam	1-3	Upland crests & slopes	Prairie uplands	Well	None	¢1.83 m	10.96	0	0	0
Norge (39)	Silt loam	3-5	Upland slopes	Prairie uplands	Well	None	¢1.83 m	11.96	0	0	0
Norge, Dennis & Prue soils, gullied (42)								0.39	0	0	0
Norge portion (20%)	Silt loam	2-8	Upland slopes	Prairie uplands	Well	None	¢1.83 m				
Dennis portion (20%)	Silt loam	1-3	Upland slopes	Prairie uplands	Moderately well	None	0.61-0.91 m				
Prue portion (15%)	Loam	3-5	Upland slopes	Prairie uplands	Moderately well	None	¢1.83 m				
Osage (46)	Silty clay	▂ 1	Floodplains	Wooded bottomlands	Poor	Occasional	0.00-0.30 m	93.66	0	1	1
Parsons (48)	Silt loam	1-3	Upland valleys	Prairie uplands	Somewhat poor	None	0.15-0.46 m	1.81	0	0	0
Parsons-Carytown complex (49)								1.98	1	0	1
Parsons portion (45%)	Silt loam	0-3	Upland valleys	Prairie uplands	Somewhat poor	None	0.15-0.46 m				
Carytown portion (35%)	Silt loam	1-3	Upland valleys	Prairie uplands	Poor	None	0.00-0.30 m				
Prue (51)	Loam	3-5	Upland slopes	Prairie uplands	Moderately well	None	¢1.83 m	7.01	0	0	0
Steedman (56)	Silt loam	3-5	Upland slopes	Prairie uplands	Moderately well	None	0.15-0.30 m	0.59	0	0	0
Steedman-Coweta complex (57)								18.64	0	0	0
Steedman portion (65%)	Silt loam	8-15	Upland slopes	Prairie uplands	Well-Mod. well	None	0.15-0.30 m				
Coweta portion (20%)	Loam	3-8	Upland crests & slopes	Prairie uplands	Well-SW excess.	None	¢1.83 m				
Steedman-Coweta complex (58)								49.77	0	4	4
Steedman portion (55%)	Silt loam	20-25	Upland slopes	Prairie uplands	Well-Mod. well	None	0.15-0.30 m				
Coweta portion (20%)	Loam	15-20	Upland crests & slopes	Prairie uplands	Well-SW excess.	None	¢1.83 m				
Stephenville-Darnell complex (59)								40.85	1	0	1
Darnell Portion (30%)	Fine sandy loam	1-5	Upland crests & slopes	Wooded uplands	Well-SW excess.	None	¢1.83 m				
Stephenville portion (45%)	Fine sandy loam	1-5	Upland crests & slopes	Wooded uplands	Well	None	¢1.83 m				
Verdigris (66)	Silt loam	▂ 1	Floodplains	Wooded bottomlands	Moderately well	Occas.-Freq.	0.61-0.91 m	148.91	0	1	1
Verdigris soils 1/ (67)	Silt loam	0-1	Floodplains	Wooded bottomlands	Moderately well	Occas.-Freq.	0.61-0.91 m	166.08	0	1	1
Wynona (70)	Silty clay loam	▂ 1	Floodplains	Wooded bottomlands	Somewhat poor	Occasional	0.00-0.61 m	3.70	0	0	0
TOTAL								1517.06	14	15	26

Table 4
Cultural sequence
(after Wyckoff and Brooks 1983:13 and [illegible]y 1981:448)

HISTORIC

Periods	Dates
Other Settlements (Historic Osage and Euro-American)	A.D. 1870-2000
Industrial Locations	A.D. 1870-2000
Osage Reservation opened	A.D. 1870
Military Forts/Battlefields	A.D. 1850-1870
Trading Posts/Trading Areas	Early 1800s
Historic tribes (Witchita, Cherokee, Osage)	A.D. 1600-1870

PREHISTORIC

Periods	Dates	Subsistence Modes	Diagnostics
		VILLAGE PERIOD	
Caddoan Villagers	A.D. 700-1500	Horticulture, hunting and gathering	Eastern Ok: ceremonial centers w/mounds; permanent houses; well-developed ceramics
Plains Villagers	A.D. 1000-1550	Horticulture, hunting and gathering	Western Ok: Hamlets & villages w/permanent houses; many farming tools; bison hunting
		WOODLAND PERIOD	
Pruitt Complex	A.D. 500-1000	Hunting and gathering, some horticulture	Central/western Ok: cord marked ceramics; corner notched arrow points; occasional shell, bone or chipped stone hoes
Cooper Complex	A.D. 1-700	Hunting and gathering, some horticulture	Northeast: grit tempered, dentate stamped ceramics; chipped stone hoes; corner notched arrow points.
Fourche Maline Phase	A.D. 1-700	Hunting and gathering, some horticulture	Southeast: clay tempered, flat bottomed vessels; chipped stone hoes; corner notched arrowpoints; contracting stem knives/dart points
		ARCHAIC PERIOD	
Late Archaic	200 B.C.-A.D. 1	Hunting and gathering, horticulture?	Increased use of ground stone tools & specialized objects; evidence of long distance trade; frequent use of some sites; perhaps adoption of ceramics, horticulture, bow and arrow.
Middle Archaic	4000-2000 B.C.	Hunting and gathering	Predominant use of expanding stem spear points; Clear Fork gouges; more use of ground stone tools than previously
Early Archaic	7000-4000 B.C.	Hunting and gathering	Emphasis on hunting; use of lanceolate points
		PALEO-INDIAN PERIOD	
Folsom Complex Hell Gap Complex	8500-7000 B.C.	Hunting and gathering, bison main prey	Fluted & unfluted lanceolate spearpoints; stone tools oriented hunting tasks
Clovis Complex	9500-8500 B.C.	Hunting and gathering, mammoth main prey?	Large fluted, lanceolate spearpoints; assemblage composed largely of chipped stone hunting-oriented tools
Pre-Clovis	15,000-9500 B.C.?	Hunting	Cooperton mammoth kill is only known site; assemblages poorly known

Hogshooter and Lawrence in northeastern Oklahoma (Bobalik 1975:4). The assemblage recovered from two sites recorded during the current project (340s-527 and 340s-532) suggests that they were occupied during the Late Archaic Period and the records document three previously recorded sites in the project area (340s-29, 340s-52 and 340s-79) that were occupied sometime during the Archaic Period.

Evidence from the eastern woodlands indicates that the Woodland Period included the introduction of pottery, horticulture and the bow and arrow as well as a more sedentary lifestyle. Some of the earliest evidence of horticulture has been recovered from sites in the area of northeast Oklahoma that includes Osage County (Wyckoff and Brooks 1983:16). The strongest

evidence from the general area comes from the quarry sites in Kay County. Several rock shelters located on Birch Creek, Hominy Creek and Little Caney River in eastern Osage and Washington counties have been identified as the remains of temporary Late Woodland Period seasonal occupations (Wyckoff and Brooks 1983:39). The available radio-carbon dates group around A.D. 200 with assemblages that are similar to those found near the Kansas City area suggesting that groups from the Missouri River area may have settled in northeast Oklahoma and southeast Kansas (Wyckoff and Brooks 1983:16). Other evidence from this period suggests that indigenous groups began adopting horticulture either on their own or through contact with other groups. Evidence of the Woodland Period is limited to part of the previously reported assemblage at 340s-29 in the project area.

Horticulture during the Village Period became strongly established with large villages located on major drainages such as the Arkansas, Red and Washita rivers (Wyckoff and Brooks 1983:17-18). Evidence of Village Period activity in the vicinity of the current project has been recorded at the Bowling Alley and possibly Freeman sites (Bobalik 1975:6). The assemblage at Freeman suggests a stronger relationship to the Plains Village tradition than the more eastern Caddoan Village tradition (Bobalik 1975:6). The general evidence indicates that the occupation of the region was probably limited to "hunting parties from Plains Villager settlements along Grand River, some 100 km to the east, and along the Arkansas River, some 90 km to the west (Wyckoff and Brooks 1983:39)." The assemblage recovered from two sites recorded during the current project (340s-530 and 340s-533) suggests that they were occupied during the Village Period. The assemblage recovered at 340s-530 may have resulted from temporary occupation during the Spiro Phase.

Of the 39 Osage County sites that Wyckoff and Brooks (1983:123-126) list as in need of additional research and preservation there are 10 general prehistoric components, seven Archaic components, 14 Woodland components, 15 Plains Village components and two Historic components. Previous investigators found that sites dating prior to the Late Archaic Period, such as the Paleo-Indian remains recovered from the Domebo site in Caddo County, are relatively few (Drass 1985:44-47; Vehik and Ashworth 1983:10; Rohrbaugh and Wyckoff 1969:21-22). Possible reasons for this rarity is suggested by the results of work conducted in the Little Caney Basin that demonstrated that "Late Archaic sites have high local densities in at least some portions of the basin, but that they are deeply buried and not visible at the present surface (Reid and Artz 1984:189)." Vehick (1985c:302) notes that a short period of alluviation occurred approximately 2000 B.P. that buried the Archaic Period sites and left a new surface for the sites during the Woodland and Village periods. Vehik (1982) also suggests that Woodland sites may be under represented due to partial burial as the period of alluviation tapered off. In addition to the Archaic, Woodland and Village period sites mentioned above, evidence from the remaining seven prehistoric sites (340s-518, 340s-519, 340s-522, 340s-525, 340s-526, 340s-531 and 340s-534) can only be placed in the general prehistoric period due to a lack of diagnostic material.

HISTORIC SEQUENCE

Historic Period sites have been largely ignored in work conducted in Osage County. No systematic studies of historic archeological sites have been published until recently (Vehik 1985a; Vehik et al. 1979) and most reports do not mention that historic sites were recorded. An historic archeological

sequence has not been developed for Osage County but a general description of historic events affecting the county can be developed.

As a result of Euro-American contact the native inhabitants of the area began to radically alter their life styles through the acceptance of the horse, gun and European trade goods. At least two historic Witchita villages dating to the early eighteenth century are known along the Arkansas River and by the latter part of the century the Osage had begun to settle along the Arkansas (Vehik 1985a:12). The Beaver Creek area may have been visited by Onate's 1601 expedition (Vehik 1985f as cited in Vehik 1985c:327). The Bryson-Paddock and Deer Creek sites in Kay County are two Witchita villages visited by Claude Du Tisne in 1719 (Bell 1984:364). European artifacts from these sites include native-made gun flints, glass beads, guns parts, conical-shaped metal tinklers, copper kettle fragments and knives (Bell 1984:374-376). Contact with Europeans and Americans continued to increase and following the American acquisition of the Louisiana Purchase in 1803 the native inhabitants of this region were forced to modify their homelands for the resettlement of many eastern tribes. Early in the second quarter of the nineteenth century the Cherokee had begun to be settled into what became known as the Cherokee Outlet. In 1870 the Osage were settled on a reservation carved from the eastern part of the Cherokee Outlet. According to Burrill (1972:535, Figures 2-5) the Osage began granting large scale grazing leases along the northern border of the reservation (close to the current project area) in 1883.

Information on the Osage homesteads administered by the Salt Creek station under the Pawhuska agency indicate the homestead selections in 1875 tended to cluster along broad stream valleys (Vehik 1985b:299). The current project is located in the area that was administered by the Little Osage station where 96 homesteads had been established (Vehik 1985b:298). Vehik notes differences in the Osage reactions to the federal pressure to homestead. Vehik (1985b:299) notes that the selections by the Osage tend to be concentrated along stream valleys with little evidence of clustering. The Osage in the area administered by the Little Osage station had a higher rate of activity on the homesteads than at most of the other stations with an average of 1.6 buildings per claim, wells had been dug on 71% of the claims and fruit trees had been planted on 82% of the claims (Vehik 1985b:300). A lower concentration of full-blood Osage were noted in the Osage administered by the Little Osage station based on a high percentage of French surnames. Vehik continues by suggesting that the differences in activity on the Little Osage homesteads may have been due to previous adaptation to Euro-American attitudes and beliefs. In addition to the native American inhabitants, the settlement of Osage County has included a variety of Anglo-Americans as well as recent immigrants from Mexico and eastern European countries (Bernard 1980; Smith 1980). Many of the Osage chose to lease their farms to Anglo-American tenants while the Osage remained in their villages.

Getty (1981:448) has noted that a significant amount of Euro-American historical archeology and related research has been accomplished in Oklahoma. In his discussion covering the entire state, Getty (1981:448) suggested that the Euro-American historic sites could easily be separated into four functional categories including trading posts and trading areas, military forts and battle grounds, other Euro-American settlements and industrial archeology. Given the current limited knowledge of historical archeology in Osage County these categories offer an initial framework from which various sites can be investigated and a chronology can be developed. Activities representing each of these functional categories have occurred at various

sites in or close to Osage County. While at least part of the small historic sites in Osage County may be the result of the rural Indian population, Getty (1981:456) suggested that they approximate Euro-American sites as they tend to be indistinguishable from the remains of rural Euro-American habitations.

Many of the early Euro-American residents and travelers of Osage County provided at least part of their economic support through trading activities. This is evidenced by the historic material recovered from such sites as Deer Creek, Bryson and Love located west of the project area near Kaw Reservoir (Bobalik 1975:6). The earliest known trading expedition that crossed Osage County occurred in 1821 when a party of twenty men under Jacob Fowler passed through from Ft. Smith to Taos (Morris and McReynolds 1965:17). The route of the Fowler party appears to have come close to the current project area by following Caney Creek for part of the journey. While no trading posts are known to be located within the project area Gray Horse Trading Post was located in Osage County just southeast of Fairfax (Wright 1958:306). Numerous trails that were used by the local inhabitants as well as by travelers cut across the northern part of the county near the project area (Burns 1981). The earliest of these trails were used by the Indians near the beginning of the nineteenth century (Burns 1981:422). One of the trails that developed as cattle were driven to market prior to the construction of railroads turned northwest from Fort Gibson along the northern side of the Arkansas River cutting across Osage County (Morris and McReynolds 1965:40). During the latter part of the nineteenth century a system of railroads was constructed across the county although many of these were short lived as unprofitable lines were abandoned (Morris and McReynolds 1965:52).

While Oklahoma was the location of many nineteenth century frontier forts none were located in Osage County. Fort Arbuckle, located in south central Oklahoma, was originally begun just south of Osage County in 1850 before the location was moved the following spring (Justiss 1976:12-13; Morris and McReynolds 1965:24). During the Civil War the battle of Chustenahlah occurred in December 1861 on Hominy Creek (Wright 1958:306).

The majority of the known historic sites in and around the project area are the result of other Euro-American activities. Most of these Euro-American sites tend to be the locations of individual rural farmsteads (examples from the current project include the farmsteads and dwellings at 340s-514, 340s-516, 340s-520, 340s-524, 340s-525, 340s-528, 340s-529 and 340s-530, historic dumps at 340s-513 and 340s-515, graffiti at 340s-519 and the indetermanent historic remains at 340s-517 and 340s-521) and villages and communities. In eastern Osage County the Labadie Cabin has been described as the home of the Osage Labadie family (Prewitt 1981:24). The cabin was described as a two story log structure exhibiting full dovetailing with squared corners (Prewitt 1981:24-26). In a discussion of both the Osage and the Delaware log cabins that were investigated in the Copen Lake vicinity, Prewitt also notes that while all of the log cabins had or showed evidence of having some sort of flooring none was evident in the old log structures of the Big House religion. The Quaker mission school at Hillside was established just east of Osage County in 1882 (Miller 1926), the St. Louis Industrial School for girls in Pawhuska and St. Johns school for boys near Hominy were built by the Catholics in 1887 and 1888 (Nieberding 1954) and the Osage Indian Agency was established at Pawhuska in 1872 (Wright 1958:306).

The economy of the area has benefited from a variety of industrial and agricultural concerns that have resulted in a variety of related sites. As early as 1878 a grist mill was erected on the Caney River by Nelson F. Carr just east of Osage County near Bartlesville. Following the rationing of

cattle to the Osage in 1882 a thriving beef and dairy industry developed in the county (Russell 1954:389; Litton 1957:58). During the last decade of the nineteenth century oil was discovered in Osage County along Bird Creek and Salt Creek and the industry developed (Forbs 1941; Burchardt 1963 and Morris and McReynolds 1965:51). An example from the current project is the remains of a well pumping facility at 340s-523 and the possibly associated residence at 340s-524. The mineral resources of the area have begun to be exploited by companies such as the National Zinc Company which has been in business since 1907 in Bartlesville and a steel foundry located in Sand Springs (Litton 1957:73).

PROJECT METHODOLOGY

The field methods used during this project were consistent with field procedures presented in the HPA technical proposal and outlined in the SOW. A pedestrian reconnaissance of selected portions of shoreline and near shoreline areas of Hula Lake was conducted. The purpose of the survey was to locate, record and describe cultural resources within the project area. Each survey tract was traversed twice from end to end with transects spaced 10 m to 25 m apart, depending on the terrain. Areas of steeper bank and high elevation were traversed in wider transects and vice versa. For the most part, ground surface visibility was good to excellent and shovel testing was unnecessary. In areas where the ground surface was obscured, shovel test transects were spaced at 30 m - 50 m intervals. The maximum interval between shovel tests was 50 m, with closer spacing in areas considered likely for site occurrence. Each shovel test was excavated to a minimum depth of 30 cm but varied in depth from 30 cm to 75 cm. The excavated matrix from each test was carefully examined for cultural material and the test backfilled.

When cultural resources were located, a surface collection was made and an Oklahoma Archeological Survey site form was completed. When a site was collected an attempt was made to obtain a representative sample of all materials present. All visible artifacts were collected on small sites.

Determinations of site size were made based primarily on the distribution of surface materials. Shovel testing was conducted at sites to determine the nature and depth of cultural deposits and to examine the soil profiles. All recovered cultural materials were placed in bags marked with the appropriate provenience and were moved to the Fayetteville laboratory for processing and analysis. A record of the soil profile of each shovel test was recorded and included the depth, type of soil and Munsell color for each observed strata as well as other data considered important. Each site was also plotted on the appropriate USGS quadrangle. Black and white photographs documenting the general nature of the project were taken at the discretion of the field supervisor. General field notes were maintained in a standard field notebook while site information was recorded directly on the site forms.

Any location containing two or more prehistoric artifacts in close proximity was regarded as an archeological site. Historic materials were treated somewhat differently for a number of reasons. The lake is a receptacle for modern garbage including bottles, cans, jars, plastic containers, styrofoam, fishing gear, broken coolers, clothing and other refuse that has since been deposited along the shoreline by fluctuations in the water level. Unofficial campgrounds are scattered around the lake and associated modern middens are rapidly accumulating. These two factors place the origin of historic materials in question in may areas.

When historic materials not directly attributable to flood or lake

deposition were encountered, the immediate area was thoroughly searched for evidence of an historic occupation. This could take the form of structural evidence such as foundations, wells, root cellars, collapsed structures or more subtle evidence such as large accumulations of glass, ceramics, metal artifacts, flower beds or other remains that might indicate historic activities. If no such evidence was observed, the presence of the historic material was noted but the location was not recorded as a site. When recent historic materials were found on a prehistoric site, the same procedure was followed and, if no evidence of local occupation was found, the material was recorded as a component but no collections were made.

All recovered cultural materials were processed in the HPA laboratory in Fayetteville. All artifacts were washed, sorted into functional categories, counted and weighed. The resulting data were recorded on standard HPA analysis forms. Temporally and/or functionally diagnostic artifacts were then described. Prehistoric materials were analyzed according to established HPA criteria (Klinger et al. 1983:101-109; Klinger and Imhoff (1986:63-67) that sort chipped lithics into a reduction sequence, beginning with raw materials and ending with finished tools. Historic materials were sorted into categories that provide both temporal and functional information.

SAMPLING DESIGN

The Scope of Work (3a) required a 25% stratified random sample survey of the effected shoreline area and a survey of 1,380 acres (558.5 ha) of project lands above the shoreline. Preliminary (not National Register level) evaluation of sites located during survey was required, as well as predictions about site occurrence throughout the proposed project impact area.

Our approach to accomplishing these requirements was to generate a stratified random sample of the impact area. The goals of the sampling design were to collect data from the eastern and western sides of the basin, to collect data from tributary streams entering the basin and to revisit a sample of previously recorded sites.

The reservoir was stratified from north to south by township. Two townships (28N and 29N) were within the sampling universe. The basin was stratified from east to west along the line between ranges 10E and 11E. This established four sampling quadrants.

After these strata were established, a table of random numbers was used to select one sample stratum from each quadrant. This procedure was followed to obtain seven sample strata. Within each selected stratum, a survey transect was marked off along the shoreline, beginning in the north and moving south for an average distance of one mile (1.6 km). When duplicate random numbers were selected within a quadrant, additional one mile transects were added to the initial transect. The shoreline was used to mark the transects because it was the only satisfactory method of determining if our sample had been achieved. The random sample thus generated actually represents less than 25% of the project area. An additional several miles were reserved to select on an intuitive basis to ensure complete coverage of all areas that may have been missed in the random sample. This allowed the inspection of several areas in the reservoir that would have not otherwise been checked. Additional transects were also generated by surveying outside of the sample transect while recording sites or checking likely areas adjacent to sample transects. Eight transects were thus surveyed by HPA at Hula Lake. Due to the irregular shoreline, discrepancies between the actual shoreline and the shoreline represented on the quad maps and the addition of the intuitive transects, the

lengths of the transects were quite variable. The widths of the transects also varied depending on the elevation of the surveyed area, the absence or presence of sites and ground surface visibility (Table 2).

ANALYTICAL METHODS

One of the major tasks of the Scope of Work involves constructing a model of site distribution on project lands. Certain methods other than those routinely used by archeologists to assess the age and probable function of individual sites have been used.

Use of Soil Mapping

Previous work (Cochran 1979; Imhoff 1980, 1982; Klinger 1985; Klinger and Imhoff 1986) has shown that archeological sites tend to be located within fairly restricted portions of the environment and that Soil Conservation Service (SCS) maps are useful in environmental modeling. In the Hulah Lake work, we have used the available soil mapping and soil characteristics contained in Bourlier et al. (1979) to identify important environmental variables and to quantify each so that the observed distribution of sites can be compared to an expected distribution that reflects variation in the environment (Table 3).

While soil mapping is useful for environmental modeling it is not without its problems. The maps and information presented in SCS county soil surveys are intended for land use management purposes rather than scientific research. The mapping units shown on the aerial photos are not absolutely accurate and can be in error by as much as 15%. Soils less than about five acres in extent are not mapped separately but included within larger units. This is particularly true for upland soils which are often grouped into complexes that include two or more major types because of the extremely detailed mapping that would be required to separate the individual components. Our ability to sort the survey areas into the various environmental attributes is therefore variable. For example, sorting the areas into topographic or biotic categories is fairly straightforward but sorting them into categories of slope or depth to seasonal high water table requires combining some soil types into larger categories.

The Hulah project encompasses five **soil texture** categories. From coarse to fine, these include fine sandy loam, loam, silt loam, silty clay loam and silty clay. Because several of the mapping units are soil complexes that include soils of differing surface texture we have developed six categories that rank the soils from coarse to fine textures to the extent possible. These categories include fine sandy loam, loam/fine sandy loam, loam, loam/silt loam, silt loam and silty clay/silty clay loam. The last category could be divided into separate groups of silty clay and silty clay loam, but was not because only 3.7 project acres included silty clay loams.

Soils at Hulah are described by 11 categories of **slope**. These include less than 1%, 0% - 1%, 0% - 3%, 1% - 3%, 1% - 5%, 3% - 5%, 1% - 8%, 3% - 8%, 3% - 15%, 15% - 25% and 25% - 45%. We have combined several of these categories to eliminate those that encompass small acreages and to eliminate categories that seem redundant. The following categories have been combined: less than 1% and 0% - 1% = 0% - 1%; 0% - 3% and 1% - 3% = 0% - 3%; 1% - 5% and 3% - 5% = 1% - 5%; 1% - 8% and 3% - 8% = 1% - 8%; and 3% - 15%, 15% - 25% and 25% - 45% = 3% - 45%.

Information relating to characteristic **topographic setting** for the soil

types is particularly weak, primarily because of the complex mapping units. In addition, the floodplain soils are not classified as to the precise type of floodplain topography. Categories include upland crests and slopes, upland slopes and valleys and floodplains.

Native **vegetation** has been altered by modern farming practices and recreational uses associated with Hulah Lake. The soils present were formed under three major kinds of vegetation including bottomland hardwood forest, upland hardwood forest and upland prairie.

Soils in the survey areas fall into several **drainage** categories, some of which overlap a number of SCS designations because of the use of complex mapping units and required considerable lumping to arrive at sensible analytical units. These categories include well to somewhat excessively drained, well drained, well to moderately well drained, moderately well drained, somewhat poor to somewhat excessively drained, somewhat poorly drained, poor to moderately well drained, somewhat poorly drained, poor to somewhat poorly drained and poorly drained. The last six have been combined into a single category of poor to somewhat excessive.

Soils in the survey areas have been classified according to **flooding** characteristics and include those that are never flooded, those that are rarely flooded, those that are occasionally flooded and those that are occasionally to frequently flooded.

Depth to **seasonal high water table** is extremely variable (see Table 3). We have developed five categories that rank the soils from those with shallow water tables to those with deep water tables. These categories are grouped according to the shallow end of the range specified in Bourlier et al. (1979). While much overlap between the categories is evident, they generally rank the soils from those with shallow water tables to those with deep ones. The categories derived include 0.00 m - 0.91 m, 0.15 m - 1.83 m, 0.30 m - 1.83 m, 0.61 m - 1.83 m and over 1.83 m.

Mathematical and Statistical Methods

Before discussing the statistical techniques used, we hasten to point out that the validity of the results depends on being able to make a number of assumptions. For example, we must be able to assume that the areas surveyed are representative of the project as a whole, that the selected environmental categories are valid, that all of the sites actually present were discovered, that the interpretations of the archeological data are correct and so forth. We say this not to place doubt on the veracity of any aspect of the work but to point out that the results obtained are not perfect mostly for reasons that apply to virtually all studies of this kind.

We have elected to use a Chi Square goodness of fit test to the data rather than more powerful parametric statistics because the data may not meet the assumptions necessary to use them. We can probably assume that our sample of environmental zones and sites comes from a sampling universe that is not normally distributed. This observation alone negates the validity of just about any parametric technique one might use.

Assumptions underlying the Chi Square goodness of fit test are less stringent. This technique uses a single sample in an r x 1 contingency table in which observed and expected frequencies (frequencies of archeological sites in this case) are compared and is used when independently sampled observations fall into one of several predetermined categories that are part of a single classification scheme (McCall 1970:291). The assumptions underlying this

statistic are that t observations are independently and randomly sampled, each observation must fall into only one category, the sample size must be fairly large and that the classification scheme must be predetermined.

A second key consideration in selecting the Chi Square test centers on the use of expected frequencies for comparative purposes. Simple site frequencies are very often misleading and we have chosen to emphasize site density. By this we mean the number of sites observed minus the number of sites expected divided by the number of acres for each analytical category. The end result of this calculation is a number we have chosen to call net density representing the number of sites per acre where a positive number indicates a greater-than-expected density, a number of zero indicates a density that is as expected and a negative number indicates a less-than-expected density.

The statistic is an often used formula where Chi Square equals the sum of each observed frequency (O_j) minus the expected frequency (E_j), quantity squared, divided by the expected frequency. The critical level of significance will be set arbitrarily at the .05 level with r-1-k degrees of freedom (Conover 1971:190-191). The expected frequencies are computed by multiplying the average number of sites per acre by the number of acres in each environmental category.

RESULTS

GENERAL SITE CHARACTERISTICS

Twenty-three previously unknown sites were recorded during the fieldwork and two previously recorded sites were revisited. One previously recorded site (340s-52) could not be relocated. General characteristics of the sites are summarized in Table 5. Twelve of the sites exhibit twentieth century historic components, eleven exhibit prehistoric components and three exhibit both historic and prehistoric components.

The historic components all date to the first half of the twentieth century although some may have originated late in the nineteenth century. Eight of these sites represent farmsteads, two represent industrial activities, two represent dumps and three represent various specialized activity areas.

Six of the prehistoric components are of unknown origin, five exhibit Archaic Period occupations, one (and possibly two) exhibits Woodland Period occupations and two reflect Village Period activities. There are three open habitations, six specialized activity areas and five for which the function could not be determined.

SITE DESCRIPTIONS

340s-29

340s-29 is a prehistoric site recorded in November 1955 by Rex Wilson. Materials reported included arrow points, small dart points, mussel shell and chert flakes. Outline drawings of nine points accompanying the site form appear to include a Calf Creek, four Ellis, a Williams, a Gary and two unidentifiable types (Perino 1985:62, 124, 144, 397). None appear to be arrow points.

The site was revisited by HPA on 12 April 1986. It is located at the

Table 5
Characteristics of Hulah Lake sites

State Site No.	Field No.	Survey Unit	Size m2	Cultural Affiliation Prehistoric	Historic	Site Function	Site Condition	Features Noted?	Soil Type(s)
34Os-29	-	II-6	15400	Archaic?/Woodland?		Specialized activity	Unknown	No	Mason silt loam,0-1%
34Os-52*	-	I-5/II-2	6300	Archaic?		Unknown	Unknown	No	Mason silt loam,0-1%
34Os-74	-	II-6	52500	Archaic?		Unknown	Unknown	No	Mason silt loam,0-1%
34Os-513	HL-1	I-7	10		20th cen	Dump	Totally destroyed	No	Steeman-Coweta cpx, 15-25%
34Os-514	HL-2	I-7	2400		20th cen	Farmstead	76-99% disturbed	No	Steeman-Coweta cpx, 15-25%
34Os-515	HL-3	I-7	15		20th cen	Dump	Totally destroyed	No	Steeman-Coweta cpx, 15-25%
34Os-516	HL-4	I-7	20000		20th cen	Farmstead	26-50% disturbed	Yes	Coweta-Bates cpx, 1-8%
34Os-517	HL-5	I-7	10		20th cen	Specialized activity	76-99% disturbed	Yes	Steeman-Coweta cpx, 15-25%
34Os-518	HL-6	I-7	1080	Indeterminate		Unknown	Totally destroyed	No	Parsons-Carytown cpx, 0-3%
34Os-519	HL-7	I-4	60		20th cen	Rock shelter	≤25% disturbed	Yes	Verdigris soils
34Os-520	HL-8	II-3	4200		20th cen	Farmstead	26-50% disturbed	Yes	Mason silt loam, 0-1%
34Os-521	HL-9	II-3	6362		20th cen	Farmstead	Totally destroyed	No	Mason silt loam, 0-1%
34Os-522	HL-10	II-3	707	Indeterminate		Open habitation	Totally destroyed	No	Mason silt loam, 0-1%
34Os-523	HL-11	II-3	10625	Woodland	20th cen	Open habitation, Oil industry	26-50% disturbed	Yes	Mason silt loam, 0-1%
34Os-524	HL-12	II-3	5600		20th cen	Industrial	26-50% disturbed	Yes	Mason silt loam, 0-1%
34Os-525	HL-13	II-4	11309	Indeterminate	20th cen	Specialized activity Farmstead	76-99% disturbed	No	Coweta-Bates cpx, 1-8%
34Os-526	HL-14	II-4	500	Indeterminate		Unknown	Totally destroyed	No	Dennis silt loam, 3-5%
34Os-527	HL-15	II-6	24052	Archaic		Unknown	Totally destroyed	No	Mason silt loam, 0-1%
34Os-528	HL-16	II-6	33800		20th cen	Farmstead	26-50% disturbed	Yes	Dennis-Carytown, cpx 1-5%
34Os-529	HL-17	II-6	18000		20th cen	Farmstead	≤25% disturbed	Yes	Osage silty clay
34Os-530	HL-18	II-6	22500	Caddo	20(19?)th cen	Open habitation, Farmstead/dump	26-50% disturbed	No	Mason silt loam, 0-1%
34Os-531	HL-19	II-6	2000	Indeterminate		Specialized activity	Totally destroyed	No	Mason silt loam, 0-1%
34Os-532	HL-20	II-6	300	L. Archaic		Specialized activity	Totally destroyed	No	Mason silt loam, 0-1%
34Os-533	HL-21	II-7	100	Village		Specialized activity	Totally destroyed	No	Mason silt loam, 0-1%
34Os-534	HL-22	II-7	17700	Indeterminate		Specialized activity	≤25% disturbed	No	Stephenville-Darnell cpx, 1-5%

*Not relocated

southern end of a cultivated field north of a bend in the Caney River at 760 ft amsl. Boulanger Landing is approximately 900 m to the southeast. Vegetation in the vicinity is composed of bottomland hardwoods along the river with soils represented by Mason silt loam, 0% - 1% and 1% - 3% slopes.

Artifacts were observed on the surface of the plowed field over an area about 140 m in diameter, but the site apparently does not extend into the wooded area south of the field since shovel tests excavated there produced negative results. The depth of the cultural deposits is not known.

A select collection of 58 artifacts (Table 6) includes lithic debitage (92.8%), a biface fragment (1.8%) and three modified flakes (5.4%). The biface may represent an adze. No culturally diagnostic items were recovered during the HPA work at the site but projectile points collected in 1955 suggest an Archaic Period occupation. The absence of midden accumulation and heavy plant processing tools such as milling basins, heavy choppers and pestals in combination with a preponderance of projectile points and tool maintenance debris suggest that the site did not function as a permanent habitation. Use as a hunting station or temporary river camp seems more appropriate. The site has suffered damage from clearing and cultivation but the exact condition of the deposits is not known.

Diagnostic artifacts were not abundant during the HPA visit, probably because the site is frequented by amateur collectors. Because the site has yielded abundant cultural and functional diagnostics in the past, excavation may yield data relevant to the questions presented above. Testing is recommended to more accurately assess the nature, extent and integrity of the cultural deposits and to determine if the site may be eligible for nomination to the National Register of Historic Places.

340s-52

340s-52 is a prehistoric site recorded in August 1963 by Sherman Lawton. Artifacts reported included double bitted axes, large hoes, an awl and Archaic projectile points. It was also noted that the site had been cultivated in July of that year and that it was occasionally inundated.

The plot of the site on the Whippoorwill quadrangle indicates that it is located at the southern end of Caney River Park north of the confluence of an intermittent stream and the Caney River at 740 ft amsl. Horizontal dimensions appear to be roughly 70 m x 90 m. The depth of the site and the condition of the deposits were not recorded.

Vegetation in the vicinity is composed of grasses and weeds in areas formerly cultivated and bottomland hardwoods along the Caney River and intermittent drainage. Soils Mason silt loam, 0% - 1% and 1% - 3% slopes.

The vicinity of the site plot was investigated by HPA on 9 March 1986 but no evidence of the site was found in spite of the excavation of a number of shovel tests. Additional work conducted in the area in late March also produced no evidence of the site. While it is possible that the site has been destroyed, evidence of disturbances sufficient to completely obliterate all evidence of prehistoric cultural activities was not apparent. It is also unlikely that the site has been buried by siltation from the lake since none of the other sites seem to have suffered such impacts. The HPA shovel testing was sufficient to detect the presence of all but the most ephemeral of occupations. It seems most likely that the site plot is in error and that no site exists in the immediate vicinity. No additional archeological work is recommended.

340s-74

340s-74 is a prehistoric site also recorded in August 1963 by Sherman Lawton, who reported the presence of Archaic cultural materials. The plot of the site on the Whippoorwill quadrangle indicates that it is approximately 300 m northwest of Boulanger Landing at 760 ft amsl. Dimensions are about 350 m x 150 m. The depth of the site and the condition of the deposits is not known. Vegetation along the river is composed of bottomland hardwoods on Mason silt loam, 0% - 1% slopes.

HPA revisited the site on 12 April 1986. At that time only 2 flakes were observed on the surface of the cultivated field. Because such a small assemblage would provide virtually no information about the site, no artifacts were collected.

Based upon our field observations, 340s-74 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-513

340s-513 is an historic site recorded by HPA on 23 February 1986. The site is situated on the north shoreline of Hulah Lake approximately 180 m northeast of Wah-Sha-She State Park across an unnamed cove. It is at an elevation of 730 ft amsl on a terrace that slopes to the southeast at a rate of about two degrees. A stock pond is located about 30 m to the northwest and 340s-514 is located about 90 m to the west along the shoreline. Vegetation in the vicinity is composed of grasses and shrubs. Surface visibility in areas exposed by shoreline erosion is 76% - 90%. Soils at the site have been subsumed with the Steedman-Coweta complex (15% - 25%) mapping unit but it is likely that they are actually of another type because of the difference in slope.

Cultural materials present include two earthenware sherds (one of which is marked "Pittsburg"), a horseshoe, two nails and some rusted sheet metal. All items visible (except the sheet metal) were collected. No evidence of structures or other features was observed. The site represents an early twentieth century dump probably associated with 340s-514.

340s-513 covers an area of about 10 square meters. The depth of the deposits is unknown but is probably restricted to the surface. Shoreline erosion has effectively destroyed the deposits.

Based upon our field observations, 340s-513 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-514

340s-514 is an historic site recorded by HPA on 23 February 1986. The site is situated on the north shoreline of Hulah Lake approximately 230 m northeast of Wah-Sha-She State Park across an unnamed cove. It is at an elevation of 730 ft amsl on a terrace that slopes to the south at a rate of about three degrees. A stock pond is located about 60 m to the northeast and 340s-513 is located about 90 m to the east along the shoreline. Vegetation in the vicinity is composed of grasses and small to medium-sized trees. Surface visibility in areas exposed by shoreline erosion is 51% - 75%. Soils at the

Table 6
Artifacts recovered from Hula

Artifact Class	Os-29	Os-513	Os-514	Os-515	Os-516	Os-518	Os-520	Os-521	Os-522	Os-523	Os-524	C
PREHISTORIC MATERIALS												
Unmod. chip'l stone						1						
Tested cobble												
Core						1						
Flake, pri. decort.	4									1		
Flake, sec. decort.	6					4			2			
Flake, interior	35					13			11	32		
Flake, retouch	2					1						
Flake, modified	3									1		
Shatter	5					3						
Biface	1					3			1			
Dart point						1						
Arrow point												
Drill												
Sherd, clay-temp., cord marked										3		
Sherd, clay-temp., plain w/slip												
Sherd, clay-temp, incised w/slip												
Sherd, clay-temp, incised												
Abrader												
Subtotal	56	0	0	0	0	27	0	0	14	37	0	
HISTORIC MATERIALS												
Button												
Glass, bottle, amber			1		5		8	3				
Glass, bottle, black							2					
Glass, bottle, blue					1		5	2				
Glass, bottle, clear			6		8		38	9				1
Glass, bottle, green					2		9	1				
Glass, bottle, pink												
Glass, bottle, purpled					1		1					1
Glass, bottle, red												
Glass, milk/opal			5				6	3				
Glass, misc												
Glass, window			1									
Ceramics, misc							2					
Earthenware, misc		2	2	3	16		5	16				
Porcelain												
Stoneware, hand paint												
Whiteware, banded							3	2				
Whiteware, plain							14	28				1
Whiteware, trans print							3	1				
Metal, jar lid												
Metal, misc		3	6									
Brick											1	
Mortar												
Other							2					
Subtotal	0	5	21	3	33	0	98	65	0	0	1	7
TOTAL	56	5	21	3	33	27	98	65	14	37	1	8

Table 6
cts recovered from Hulah Lake sites

-521	Os-522	Os-523	Os-524	Os-525	Os-526	Os-527	Os-528 Sur	Os-528 Subsur.	Os-529	Os-530	Os-531	Os-532	Os-533	Os-534
														1
		1			1	2				2	1		3	1
	2				4	4				4	5		6	4
	11	32		4	40	36				84	56	2	15	31
					5					5				1
		1								8	4		2	
											1			
	1					2			1	7	1			
						1					2	1		
										1			1	
													1	
		3												
										7				
										1				
										2				
										1				
9	14	37	0	4	50	45	0	0	1	122	70	3	28	38
										1				
							13		4	1				
2				2			9	1	9	3				
5				18			25	3	63	25				
				4			2							
				2										
				10			14		3	1				
				1					1					
1				9			3		27	1				
				2										
				1			8	2	24	16				
				4										
6				7			18		20	6				
				1			1			2				
									1					
2														
5				11			23		30	28				
							2		2					
								1						
				4			3	9	6	11				
			1	1			1	1	1					
								3						
								3						
5	0	0	1	77	0	0	122	23	191	95	0	0	0	0
5	14	37	1	81	50	45	122	23	192	217	70	3	28	38

site have been subsumed in the Steedman-Coweta complex (15% - 25% slopes) mapping unit but they actually may be another type.

Cultural materials present include two large pieces of heavy gauge sheet metal, glass, ceramics, brick (marked "Laclede King St. Louis" and "Evans-Howard Acme") and miscellaneous metal items. Items collected (Table 6) included clear and amber bottle glass (33.3%), opal glass canning jar lids (23.8%), window glass (4.7%), earthenware ceramics (9.5%), an iron buckle (4.7%), an iron stove part (4.7%), two natural gas valves (9.5%) and two unidentified metal items (9.5%). No evidence of structures of other features was observed but it seems it is probable that the site represents an early twentieth century farmstead.

The site extends along the shoreline a distance of about 80 m and is roughly 30 m wide (2,400 m^2). The depth of the deposits is unknown but they are probably restricted to the surface. Shoreline erosion has effectively destroyed the site.

Based upon our field observations, 340s-514 does not contain information which, when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-515

340s-515 is an historic site recorded by HPA on 23 February 1986. The site is situated on an east-facing shoreline of Hulah Lake approximately 650 m northeast of Wah-Sha-She State Park and about 1,300 m northeast of Turkey Creek Point Public Use Area. It is at an elevation of 730 ft amsl on a terrace that slopes to the south at a rate of about three degrees. 340s-514 is located about 490 m to the south along the shoreline. Vegetation in the vicinity is composed of grasses and shrubs. Surface visibility in areas exposed by shoreline erosion is 91% - 100%. Soils at the site have been subsumed in the Steedman-Coweta complex (15% - 25% slopes) mapping unit but it seems likely that they actually are of another type.

Cultural materials present include the body and frame of an early automobile, cast iron and ceramics. Items collected (Table 6) included three earthenware sherds. No evidence of structures or other features was observed and the site represents an early twentieth century dump.

The site encompasses roughly 15 m^2. The depth of the deposits is unknown but they are probably restricted to the surface. Shoreline erosion has effectively destroyed the site.

Based upon our field observations, 340s-515 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-516

340s-516 is an historic site recorded by HPA on 23 February 1986. The site is situated on a southeast-projecting point of land approximately 890 m northeast of Wah-Sha-She State Park, 760 m northeast of Turkey Creek Point Public Use Area and across a cove from 340s-514 and 340s-515. It is at an elevation of 730 ft amsl on a terrace that slopes to the south at a rate of about two degrees. Vegetation in the vicinity is composed of grasses trees and shrubs. Surface visibility is 26% - 50%. Soils at the site mapped as Coweta-Bates complex (1% - 8% slopes).

Cultural materials have been exposed by shoreline erosion and include large amounts of glass and ceramics. Items collected (Table 6) included 17 sherds of bottle glass and 16 earthenware sherds.

Features observed include an east-west oriented stone foundation measuring 13 ft x 30 ft (3.96 m x 9.14 m) at the southern end of the site, two other possible foundations and a large (10 ft x 10 ft; 3.05 m x 3.05 m) depression located northwest of the large foundation. These features suggest that the site represents an early twentieth century farmstead.

The site is roughly 200 m x 100 m and is oriented with the peninsula. The depth of the deposits is unknown. Somewhat less than half of the site has been destroyed by shoreline erosion.

Based upon our field observations, 340s-516 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-517

340s-517 is an historic site recorded by HPA on 24 February 1986. It is situated on the east shore of the lake directly opposite Tucker Cove and rests at an elevation of 730 ft amsl on a terrace that slopes to the southwest at a rate of about two degrees. Surface visibility is 91% - 100%. Soils at the site are mapped as Steedman-Coweta complex, 15% - 25% slopes.

The site consists of a 9 ft x 10 ft (2.74 m x 3.05 m) concrete over stone foundation. No other features were observed and no artifacts were found in association.

340s-517 encompasses roughly 10 m^2 and is apparently restricted to the surface although the actual depth of the deposits is unknown. No data were recovered that suggest either the age or function of the site. Shoreline erosion has inflicted an indeterminate amount of damage on the site.

Based upon our field observations, 340s-517 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-518

340s-518 is a prehistoric site recorded by HPA on 24 February 1986. The site is located directly opposite Turkey Creek Point Public Use Area and begins approximately 50 m northwest of 340s-516 extending in a 4 m wide strip along the shoreline for a distance of about 270 m. It is at an elevation of 730 ft amsl on a terrace that slopes to the south at a rate of about two degrees. The site is covered in pasture with surface visibility of about 11% - 25% on soils of the Parsons-Carytown complex (0% - 3% slopes).

Cultural materials have been exposed by shoreline erosion and include prehistoric lithics. Items collected (Table 6) include flint knapping debris (77.8%), a chert cobble (3.7%), a core (3.7%), three bifaces (11.1%) and an unidentified contracting stem dart point (3.7%).

An east-west transect of shovel tests was installed across the site with tests at 10 m intervals which produced only negative results. The material exposed along the shore appears to represent the edge of a larger site that is mostly submerged. The depth of the deposits is not known. The age and function of the site is not known due to an absence of cultural and functional

diagnostics. The site has been damaged to an unknown extend by shoreline erosion.

Based upon our field observations, 340s-518 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-519

340s-519 is a sandstone shelter recorded by HPA on 26 February 1986. The site is located on Pond Creek at its confluence with Spring Creek. It is at an elevation of 770 ft amsl at the base of a hillside that slopes to the west at a rate of about five degrees. Stone steps lead to the hillside above at the north end of the shelter. Ashes from a recent campfire are also present. Vegetation surrounding the site is composed of mixed hardwoods with surface visibility of about 11% - 25% on Verdigris soils.

Historic graffiti (primarily names or initials of individuals) is ubiquitous. Dates engraved on sandstone boulders lying within the shelter include 1914, April 10, 1915, March 13, 1920, 1954 and 1982. Other miscellaneous marks and grooves are present and appear to be prehistoric in origin although no prehistoric artifacts were found. No artifacts are present and disturbances other than the historic graffiti and the campfire are not evident. A shovel test showed the soils to be only 10 cm thick.

Based upon our field observations, 340s-519 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-520

340s-520 is an historic farmstead recorded by HPA on 13 March 1986. The site is situated about 360 m north of the Caney River on the south side of the road that lies on the Oklahoma-Kansas border. The town of Elgin is located about 1.1 km to the west. It is at an elevation slightly below 780 ft amsl on a terrace that slopes south toward the river at a rate of about one degree. The field surrounding the site is under cultivation. Vegetation in the vicinity is composed of mixed hardwoods along the drainages. Surface visibility on the site proper (11% - 25%) is restricted by a cover of weeds and grasses on Mason silt loam, 0% - 1% slopes.

Cultural materials exposed in the cultivated field surrounding the site is composed primarily of glass and ceramics. Items collected (Table 6) from a plowed area behind the cellar and garage include bottle and jar glass (64.3%), milk glass and opal glass canning jar lids (6.1%), various dinnerware and earthenware ceramics (37.7%) and a rubber shoe sole (1%).

A number of structural remains are present and include a house foundation, garage floor, cellar, privy, well and two outbuildings. The concrete on top of a stone wall next to the cellar steps bears the date "Aug. 1934".

The area encompassed by the foundations is roughly 120 m north-south by 35 m east-west yielding an area of about 4,200 m^2. The depth of the deposits is unknown but they are probably restricted to surface or near surface depths with isolated deeper deposits associated with features. The site is generally well preserved except where the absence of foundations has permitted plowing.

Based upon our field observations, 340s-520 does not contain information

which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-521

340s-521 is an historic site recorded by HPA on 15 March 1986. The site is situated about 215 m north of the Caney River and 40 m south of the road that lies on the Oklahoma-Kansas border. The town of Elgin is located about 800 m to the west and 340s-520 lies about 200 m to the east. It is at an elevation of 780 ft amsl on a terrace that slopes south toward the river at a rate of about one degree. The field in which the site is located is under cultivation and surface visibility on the site proper is excellent (91% - 100%). Vegetation in the vicinity is composed of mixed hardwoods along the drainages. Soils at the site are mapped as Mason silt loam, 0% - 1% slopes.

Cultural materials exposed on the surface are composed primarily of glass and ceramics. Items collected (Table 6) include bottle and jar glass (23.1%), milk glass and opal glass canning jar lids (4.6%) and various dinnerware and earthenware ceramics (72.3%). No structural remains or other features are present.

The surface scatter is roughly 90 m in diameter yielding an area of about 6,362 m^2. The depth of the deposits is unknown but they are probably restricted to the plowzone with isolated deeper deposits associated with features (if any are present). The site has been disturbed to an unknown extent by cultivation.

Based upon our field observations, 340s-521 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-522

340s-522 is a prehistoric site recorded by HPA on 15 March 1986. The site is situated about 120 m north of the Caney River and 50 m south of the road that lies on the Oklahoma-Kansas border. The town of Elgin is located about 300 m to the west and 340s-521 lies about 400 m to the east. It is at an elevation of 780 ft amsl on a terrace that slopes south toward the river at a rate of about one degree. The field in which the site is located is under cultivation and surface visibility on the site proper is excellent (91% - 100%). Vegetation in the vicinity is composed of mixed hardwoods along the drainages. Soils at the site are mapped as Mason silt loam, 0% - 1% slopes.

Cultural materials exposed on the surface are composed of lithics. Items collected (Table 6) include flakes (92.9%) and a biface (7.1%). No midden staining or evidence of features is present.

The surface scatter is roughly 30 m in diameter yielding an area of about 707 m^2. The depth of the deposits is not known, nor is the extent of disturbance by cultivation.

Based upon our field observations, 340s-522 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-523

340s-523 is a prehistoric/historic site recorded by HPA on 27 March 1986. The site is situated about 100 m north of the Caney River on the east side of a paved road leading to the town of Elgin which is located about 500 m to the north. It is at an elevation of 770 ft amsl on a terrace that slopes south toward the river at a rate of about one degree. The field in which the site is located was formerly cultivated and surface visibility on and around the site is less than 5%. Vegetation in the vicinity is composed of miscellaneous grasses in the field and mixed hardwoods along the river. Soils in the vicinity are mapped as Mason silt loam, 0% - 1% and 1% - 3% slopes.

Cultural materials exposed in a field road that crosses the site are composed of prehistoric lithics and ceramics. Items collected (Table 6) include flakes (89.2%), a chunk of chert (2.7%) and three clay tempered, cord marked sherds (8.1%). The site was shovel tested on a 15 yard (13.7 m) grid (established by pacing) with largely negative results. One test yielded a nail which was not collected. No midden staining or evidence of prehistoric features was observed but surface visibility was not sufficient to enable an accurate determination. The extent of the prehistoric component could not be determined. The depth of the deposits is not known, nor is the extent of disturbance by cultivation.

Based on information supplied by a local informant the historic component represents an oil pumping facility. Remains of the historic component include two foundation, an iron storage tank and pipe supports associated with the pumping operation. No historic artifacts were observed. The historic component encompasses an area of roughly 85 m north-south by 125 m east-west. Its depth is not known.

Little data were present that enable an assessment of the period during which the prehistoric component was occupied or specific activities that may have occurred. The pottery suggests a Woodland Period occupation that possibly functioned as a permanent or semi-permanent habitation.

Based upon our field observations, the historic component at 340s-523 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. The prehistoric component may contain information relating to the research problems listed above and should be tested to determine its nature, extent and integrity.

340s-524

340s-524 is an historic site recorded by HPA on 27 March 1986. The site is situated about 200 m north of the Caney River on the east side of a paved road leading to the town or Elgin which is located about 50 m to the north. 340s-522 lies about 450 m to the east and 340s-523 is about 400 m to the south. A stock pond lies 50 m to the south. 340s-524 is at an elevation of 780 ft amsl on a terrace that slopes south toward the river at a rate of about one degree. The field in which the site is located was formerly cultivated and surface visibility on and around the site is less than 5%. Vegetation in the vicinity is composed of miscellaneous grasses and several shade trees on Mason silt loam, 0%- 1% and 1% - 3% slopes.

Cultural remains visible include a mound of brick ("Coffeyville"), a "U" shaped limestone foundation with thick boards attached and a set of three linear concrete foundation walls surrounded by sheet metal. One of the bricks was collected. The depth of the deposits is not known.

According to a local informant this was a residence for someone working for the oil pumping facility at 340s-523. The brick and concrete of the structure have been bulldozed into a pile. The site was shovel tested on a 15 yard grid (established by pacing) with largely negative results. One shovel test yielded an iron hinge which was not collected. The site encompasses an area of roughly 70 m north-south by 80 m east-west.

Based upon our field observations, 340s-524 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-525

340s-525 is an historic and prehistoric site recorded by HPA on 31 March 1986. The site is situated on the west side of Hulah Lake in the north camping area of Turkey Creek Point Public Use Area. It is at an elevation of 735 ft - 750 ft amsl on a low ridge that slopes south toward the river at a rate of about three degrees. Vegetation in the vicinity is composed of miscellaneous grasses and trees. Surface visibility is 51% - 75%. Local soils are Coweta-Bates complex, 1% - 8% slopes and Steedman-Coweta complex, 3% - 15% slopes.

Cultural remains visible include glass, ceramics and metal as well as a very light scatter of prehistoric lithics. The only feature observed was a brick walkway located next to one of the park comfort stations. Artifacts collected included four flakes, bottle glass (48.0%), milk/opal glass (11.7%), window glass (1.3%), miscellaneous glass (2.6%), miscellaneous ceramics and earthenware (14.3%), porcelain (1.3%), plain whiteware (14.3%), wire nails (3.9%), an Indian-head nickel (1.3%) and a fragment of brick (1.3%).

The historic component appears to represent a twentieth century farmstead based on the artifact assemblage. The prehistoric component apparently represents an unidentified specialized activity area. The site encompasses an area of roughly 120 m in diameter (11,309 m^2). The depth of the deposits is not known but they are probably shallow given the general nature of historic sites and the sparse prehistoric component.

Based upon our field observations, 340s-525 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-526

340s-526 is a prehistoric site recorded by HPA on 31 March 1986. The site is situated on the west side of Hulah Lake in the north camping area of Turkey Creek Point Public Use Area. 340s-525 is located about 50 m to the north. It is at an elevation of 735 ft - 740 ft amsl on the side of a low ridge that slopes south toward the river at a rate of about three degrees. Vegetation in the vicinity is composed of miscellaneous grasses and trees. Surface visibility is 11% - 25%. Soils at the site are mapped as Steedman-Coweta complex, 3% - 15% slopes. Cultural remains visible include a light scatter of prehistoric lithics. No evidence of features or midden staining was observed. Fifty flakes were collected.

The site may represent an undefined specialized activity area but the data available do not support such a conclusion. Neither were any temporally diagnostic artifacts recovered. The site encompasses an area roughly 3 m to 4

m wide by 150 m along the shoreline (500 m^2). The depth of the deposits is not known.

Based upon our field observations, 340s-526 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-527

340s-527 is a prehistoric site recorded by HPA on 13 April 1986. The site is situated approximately 300 m north of the Caney River and about 1.2 km northwest of Boulanger Landing. 340s-529 is located immediately on the other side of a fenceline bordering 340s-527 on the north; 340s-29 is 170 m to the south and 340s-74 is 380 m to the southeast. It is at an elevation of 760 ft amsl on a terrace that slopes to the south at a rate of about one degree. The site is located in a cultivated field with vicinity vegetation of mixed hardwoods. Surface visibility is 91% - 100%. Soils in the vicinity are mapped as Mason silt loam, 0% - 1% and 1% - 3% slopes and Osage silty clay.

Cultural materials are composed of prehistoric lithics including flakes (93.3%), bifaces (4.4%) and a dart point resembling the Ellis type (Perino 1985:124). No evidence of midden staining or other features was observed.

The site is roughly 175 m in diameter and covers an area of about 24,052 m^2 and may represent a previously undefined part of 340s-29 separated by a zone of low artifact density. The depth of the deposits is not known, nor is the extent of damage resulting from plowing.

The dart point recovered suggests occupation during the Late Archaic Period but insufficient data were available to enable an assessment of activities that may have taken place.

Based upon our field observations, 340s-527 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-528

340s-528 is an historic site recorded by HPA on 15 April 1986. The site is situated north of the Caney River, approximately 1.2 km due north of Boulanger Landing. 340s-529 is located 500 m due west. It is at elevations ranging from 760 ft to 800 ft amsl on a hillside that slopes to the west at a rate of about three degrees. The site is located partially in a cultivated field and fallow partially wooded vegetation in the vicinity is composed of miscellaneous grasses and mixed hardwoods. Surface visibility in the cultivated part is 91% - 100% but less than 5% in the remainder. Soils at the site are mapped as Dennis-Carytown complex, 1% - 5% slopes.

Cultural materials exposed on the surface of the plowed part of the site are composed of historic glass, ceramics, metal and brick. Items collected from the surface include bottle glass (51.6%), milk/opal glass (2.5%), window glass (6.6%), various ceramics (36.1%), a hammer (0.8%), miscellaneous sheet metal items (1.6%) and a brick fragment (0.8%).

Features at the site include a stone foundation, a well, two small concrete pads and a large depression. Artifacts recovered from shovel tests excavated within the foundation include wire nails (13.0%), asphalt shingle fragments (13.0%), a fragment of brick (4.3%) and mortar fragments (13.0%). Artifacts recovered from shovel tests excavated outside the foundation include

canning jar fragments (17.4%), a wire nail (4.3%), a machinery part (4.3%) and a zinc canning jar ring (4.3%). Artifacts recovered from beneath the stoop include wire nails (8.7%) and an unidentified metal object (4.3%).

The site is roughly 260 m east-west by 130 m north-south and covers an area of about 33,800 m^2. The depth of the deposits is not known but historic sites are characteristically shallow with isolated deep deposits associated with features.

The artifacts recovered and the features present suggest that the site is a family farmstead dating to the first half of the twentieth century. The overall condition of the site is marginal.

Based upon our field observations, 340s-528 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-529

340s-529 is an historic site recorded by HPA on 16 April 1986. The site is situated approximately 400 m north of the Caney River and is separated from 340s-527 by an east-west running fence. It is at an elevation of 760 ft amsl on a terrace that slopes to the west at a rate of about one degree. The site is located partially in a cultivated field but is mostly overgrown with miscellaneous grasses and mixed hardwoods. Surface visibility is generally 11% - 25%. Soils in the vicinity are mapped as Mason silt loam, 1% - 3% slopes and Osage silty clay.

Cultural materials exposed on the surface of the plowed part of the site are composed of historic glass, ceramics, metal and brick but the tip of a stone drill was also found. Historic artifacts collected from the surface (Table 6) include bottle glass (41.9%), milk/opal glass (14.1%), window glass (12.6%), various ceramics (27.7%), a butt hinge (0.5%), two Oklahoma automobile registration plates (four pieces) from 1931 and 1938, an unidentified metal item (0.5%) and a brick fragment (0.5%). Features at the site include eight concrete foundations.

The site is roughly 180 m north-south by 100 m east-west and covers an area of about 18,000 m^2. The depth of the deposits is not known, but historic sites are characteristically shallow with isolated deep deposits associated with features.

The artifacts recovered and the features present suggest that the site is a family farmstead dating to the first half of the twentieth century. The overall condition of the site appears to be good.

Based upon our field observations, 340s-529 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-530

340s-530 is an historic and prehistoric site recorded by HPA on 18 April 1986. The site is situated approximately 200 m northeast of the Caney River. It is at an elevation of 765 ft amsl on a terrace that slopes toward the river at a rate of about two degrees. The site is located partially in a cultivated field but is mostly overgrown with miscellaneous grasses and mixed hardwoods. It is bounded on the north by a low-lying, marshy area and on the south by a

seasonal drainage. Surface visibility is generally 26% - 50%. Soils at the site are mapped as Mason silt loam, 0% - 1% slopes.

Cultural materials exposed on the surface of the site are composed of historic glass, ceramics, metal and brick and prehistoric lithics and ceramics. Historic surface materials are exposed mainly at the southeast end of the site and include (Table 6) a button (1.0%), bottle glass (31.6%), milk/opal glass (1.0%), window glass (16.8%), various ceramics (31.6%), fragments of wire (9.5%) and what appear to be cut nails (2.1%). Prehistoric artifacts are generally distributed across the site and include lithic debitage (84.4%), several bifaces and fragments thereof (5.7%), an arrow point (0.8%) resembling the Washita type (Perino 1985:391), clay tempered ceramics (8.2%) and a possible abrader (0.8%).

Historic features at the site include two north-south dirt roads and a rectangular concrete enclosure. One of the roads leads to the historic component while the second crosses the site roughly 35 m east of the western extent of the prehistoric component. The concrete enclosure is located on the east side of the second road and has Irises growing within it. A shovel test excavated within the enclosure produced glass and metal artifacts. No prehistoric features or midden staining were observed but surface visibility was poor over most of the prehistoric component.

The site is roughly 300 m east-west by an average of 75 m north-south and covers an area of about 22,500 m^2. The prehistoric component is about 300 m x 50 m (15,000 m^2). The depth of the deposits is not known but historic sites are characteristically shallow with isolated deep deposits associated with features.

The artifacts recovered and the features present suggest that the historic component is a family farmstead dating to the first half of the twentieth century although the recovery of the cut nails may indicate an occupation predating the turn of the century. The purpose of the concrete enclosure is not known. The condition of the historic component is not known.

The prehistoric component appears to date to the Village Period (Spiro Phase?), based upon the recovery of the Washita arrow point and the ceramics. The size and location of the site, in combination with the presence of pottery and an abrading tool, suggest that it was used for at least semi-permanent habitation. The overall condition of the prehistoric component is not known.

Because 340s-530 may contain an early historic occupation (relative to other sites in the area) and a late prehistoric component not found at other sites within the project, test excavations are recommended to determine the nature, extent and integrity of the site.

340s-531

340s-531 is a prehistoric site recorded by HPA on 18 April 1986. The site is situated approximately 500 m northeast of the Caney River. 340s-529 is located about 74 m to the south and 340s-530 is located about 350 m to the west. It is at an elevation of 765 ft amsl on a terrace that slopes toward the river at a rate of about one degree. The site is located in a cultivated field with miscellaneous grasses and mixed hardwoods growing in nearby areas. Surface visibility is 91% - 100%. Soils at the site are mapped as Mason silt loam, 0 - 1% slopes.

Cultural materials exposed on the surface of the site are composed of prehistoric lithics. Artifacts recovered (Table 6) include lithic debitage (95.7%), a biface fragment (1.4%) and stemmed dart point fragments (2.9%). The dart points are too fragmentary to classify.

The artifacts recovered and the small size of the site suggest that it is an undefined specialized activity area. The age of the site is not known since the projectile points provide no useful temporal information.

The site is roughly 50 m in diameter and covers an area of about 2,000 m^2. The depth of the site is not known, but it is probably shallow, given the probable ephemeral nature of the occupations. It has been largely destroyed if it is restricted to the plowzone.

Based upon our field observations, 340s-531 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-532

340s-532 is a prehistoric site recorded by HPA on 19 April 1986. The site is situated approximately 300 m northeast of the Caney River. 340s-529 is located about 200 m to the southeast, 340s-530 is about 200 m to the west and 340s-531 is located about 150 m to the northeast. It is at an elevation of 765 ft amsl on a terrace that slopes toward the east at a rate of about one degree. The site is located in a cultivated field with miscellaneous grasses and mixed hardwoods growing in nearby areas. Surface visibility is 91% - 100%. Soils at the site are mapped as Mason silt loam, 0% - 1% slopes.

Cultural materials exposed on the surface of the site are composed of prehistoric lithics. Artifacts recovered from the site (Table 6) include two flakes and a Marshall point (Perino 1985:241).

The artifacts recovered and the small size of the site suggest that it is an undefined specialized activity area used during the Late Archaic Period.

The site is roughly 20 m in diameter and covers an area of about 300 m^2. The depth of the site is not know but it is probably shallow given the ephemeral nature of the occupation. If it is restricted to the plowzone, it has been largely destroyed.

Based upon our field observations, 340s-532 does not contain information which when viewed in its most favorable light would make it eligible for inclusion on the National Register of Historic Places. We recommend no further work at the site.

340s-533

340s-533 is a prehistoric site recorded by HPA on 7 May 1986. The site is situated in the Hulah Lake State Game Management Area on the north side of Cotton Creek, approximately 300 m south of its confluence with the Caney River. 340s-534 is located about 1.3 km to the northwest. It is at an elevation of 730 ft amsl on a terrace that slopes toward the south at a rate of about three degrees. The site is located in a cultivated field overgrown by miscellaneous grasses, with mixed hardwoods growing in nearby areas. Surface visibility is less than 10%. Soils at the site are mapped as Mason silt loam, 0% - 1% slopes.

Cultural materials exposed on the surface of the site are composed of prehistoric lithics. Artifacts recovered from the site (Table 6) include lithic debris (85.7%), modified flakes (7.1%), a Schugtown arrow point fragment (Perino 1985:347)(3.6%) and a bifacial drill (3.6%).

The artifacts recovered, in combination with a lack of ceramics and heavy plant processing tools and the small size of the site, suggest that it is an undefined specialized activity area used during the Village Period. It

is possible that the majority of the site is submerged and that these materials do occur closer to Cotton Creek.

The site extends along the shore in a narrow band for about 70 m. The known area is about 100 m^2. The depth of the site is not known but it is probably shallow. If so, it has been largely destroyed by plowing and shoreline erosion.

340s-533 may contain significant new evidence relating to procurement activities during the Village Period and should be tested to determine its nature, extent and integrity.

340s-534

340s-534 is a prehistoric site recorded by HPA on 7 May 1986. The site is situated in a public use area in the Hulah Lake State Game Management Area on the south side of the Caney River approximately 150 m east of its confluence with Pond Creek. 340s-533 is located about 1.3 km to the southeast. It is at an elevation of 750 ft amsl on a low ridge that slopes in several directions at a rate of about three degrees. The area is overgrown with miscellaneous grasses and mixed hardwoods. Surface visibility is less than 10%. Soils at the site are mapped as Stephenville-Darnell complex 1% - 5% slopes.

Cultural materials exposed on the surface of a road crossing the north end of the site are composed of prehistoric lithics. Artifacts recovered from the site (Table 6) include a tested cobble (2.6%) and lithic debris (97.4%).

The artifacts recovered, in combination with a lack of ceramics and heavy plant processing tools, suggest that it is an undefined specialized activity area. The period of occupation is not known. The site is roughly 150 m in diameter and encompasses about 17,700 m^2. The depth of the site is not known but shovel tests indicated the presence of subsurface deposits.

Based upon our field observations, 340s-534 may contain information which would make it eligible for inclusion on the National Register of Historic Places. We recommend test excavations to determine the nature, extent and integrity of the site.

ANALYSIS OF SITE DISTRIBUTION

The distribution of sites in the areas surveyed has been studied in relation to seven soil characteristics. The rationale behind this aspect of the study is that, rather than being an entity in an of themselves, SCS soil types are names assigned to taxonomic categories composed of like sets of physical characteristics. Past work has shown that some of these characteristics are informative in the study of past human use of the environment.

Because of the small sample of sites, we have studied the distribution of only prehistoric and only historic sites. We would have liked to study more specific categories -- for example, Archaic Period base settlements or Spiro Phase specialized activity sites -- but many more of these sites would be required for such a study. Our total sample is composed of 25 sites (one of site number, 340s-535, was returned for reassignment). The sites (equal to 0.016 sites per acre or 10.6 per square mile) have been divided into 14 historic (0.009 per acre or 5.9 per square mile) and 14 prehistoric components, the distribution of which has been studied in relation to surface texture, percent slope, topography, biotic community, drainage, frequency of flooding and depth to seasonal high water table.

Where possible the results of these analyses are compared with the results found by Imhoff (1980:8-15--8-16) in the Ozark Gas survey of the Arkansas River valley and investigations that were carried out close to the current project location in the Salt Creek, Beaver Creek and Little Beaver Creek drainages in Osage and Kay counties during 1979 and 1980 (Vehik 1985c:308-309).

Site Distribution and Biotic Community

The overall distribution of sites with regard to biotic communities is significant at the .01 level (Table 7) (Chi Square = 6.71 with 1 degree of freedom). The primary contributor to the statistic is a high net density of sites in upland prairie environments, followed by a low net density in upland forest environments (Figure 4). The distribution in bottomland forest environments is about as expected. It is clear that the largest factor in the significance of the overall site distribution is the distribution of historic sites which is significant to at least the .001 level (Chi Square = 11.40 with 1 degree of freedom). High net densities in upland prairie environments, followed by low net densities in upland forest environments are the important contributing factors. The distribution in bottomland forest environments is about as expected.

The distribution of prehistoric sites is not significantly different than expected (Chi Square = 0.22 with 1 degree of freedom). These sites are distributed with almost perfect uniformity throughout the three biotic zones. Due to the fundamentally different biotic communities represented in the Ozark Gas project corridors it is not useful to compare the results with those at Hulah Lake. The biotic communities represented by the Vehik study in Kay and western Osage counties are relatively similar to those at Hulah. There it was noted that most of the prehistoric sites tended to be located on high terraces (Vehik 1985c:303) and that the terraces tend to be associated with the upland prairie environments. Vehik (1985b:299) reported that Osage sites in the Little Osage station area were concentrated in a linear distribution along stream valleys. While not specifically stated it seems likely that the locations were on the higher terraces in these stream valleys and in the upland prairie environments.

Site Distribution and Natural Drainage

The distribution of all sites in the area is statistically significant relative to natural drainage characteristics (Table 7 and Figure 4). The Chi Square (8.13 with 3 degrees of freedom) is significant at the .05 level due to a high net density of sites on soils that are well to somewhat excessively drained, followed closely by a low net density on well drained soils. Low net densities in the poor to somewhat excessive and moderately well drained categories also contribute in a limited way to the level of significance. Sites are distributed over well to moderately well drained soils about as expected.

Historic site distribution is the largest factor contributing to the significance of the overall distribution. The Chi Square value (12.19 with 3 degrees of freedom) is significant at the .01 level due primarily to a high net density of sites in the well to somewhat excessively drained category. A

Table 7
Chi Square Goodness of Fit Tests

	Acres	Prehistoric Sites Obs	Exp	Chi	Historic Sites Obs	Exp	Chi	All Sites Obs	Exp	Chi
Biotic Community										
Upland Prairie	256.55	3	2.36754	0.168954	7	2.36754	9.06413	9	4.22775	5.38688
Bottomland Forest	1129.90	10	10.42714	0.017497	7	10.42714	1.12642	15	18.61989	0.70374
Upland Forest	130.61	1	1.20532	0.034974	0	1.20532	1.20532	1	2.15235	0.61696
	1517.06	14	14.00000	0.221426	14	14.00000	11.39586	25	25.00000	6.70758
Drainage										
Poor-SW Excess.	203.03	1	1.87364	0.407358	1	1.87364	0.40736	2	3.34578	0.54132
Moderately Well	374.83	1	3.45907	1.748167	2	3.45907	0.61545	3	6.17691	1.63395
Well-Mod. Well	694.03	10	6.40477	2.018133	5	6.40477	0.30811	13	11.43708	0.21358
Well	55.80	0	0.51494	0.514943	0	0.51494	0.51494	0	0.91954	0.91954
Well-SW Excess.	189.37	2	1.74758	0.036460	6	1.74758	10.34752	7	3.12067	4.82241
	1517.06	14	14.00000	4.725062	14	14.00000	12.19338	25	25.00000	8.13080
Frequency of Flooding										
None	387.16	4	3.57286	0.051065	7	3.57286	3.28737	10	6.38010	2.05383
Rare	693.64	10	6.40117	2.023313	5	6.40117	0.30671	13	11.43066	0.21546
Occasional	121.27	0	1.11913	1.119125	0	1.11913	1.11913	0	1.99844	1.99844
Occas.-Freq.	314.99	0	2.90685	2.906846	2	2.90685	0.28291	2	5.19080	1.96139
	1517.06	14	14.00000	6.100350	14	14.00000	4.99611	25	25.00000	6.22912
Percent Slope										
0 - 1%	1056.17	10	9.74673	0.006581	7	9.74673	0.77406	15	17.40488	0.33229
1 - 3%	142.78	1	1.31763	0.076567	0	1.31763	1.31763	1	2.35291	0.77792
1 - 5%	144.04	2	1.32926	0.338459	1	1.32926	0.08156	3	2.37367	0.16527
1 - 8%	80.50	1	0.74288	0.088988	2	0.74288	2.12730	2	1.32658	0.34185
3 - 45%	93.57	0	0.86350	0.863499	4	0.86350	11.39275	4	1.54196	3.91835
	1517.06	14	14.00000	1.374095	14	14.00000	15.69330	25	25.00000	5.53567
Depth to Seasonal High Water Table										
0.00-0.91 m	176.06	0	1.62475	1.624747	1	1.62475	0.24023	1	2.90134	1.24600
0.15-1.83 m	70.81	1	0.65346	0.183773	4	0.65346	17.13846	5	1.16690	12.59127
0.30-1.83 m	25.16	0	0.23219	0.232185	0	0.23219	0.23219	0	0.41462	0.41462
0.61-1.83 m	367.62	1	3.39254	1.687300	2	3.39254	0.57159	3	6.05810	1.54371
over 1.83 m	877.41	12	8.09707	1.881281	7	8.09707	0.14864	16	14.45905	0.16422
	1517.06	14	14.00000	5.609289	14	14.00000	18.33111	25	25.00000	15.95982
Surface Texture										
Fine Sandy Loam	119.4	1	1.10187	0.009417	0	1.10187	1.10187	1	1.96762	0.47585
Loam/Fine Sandy Loam	25.16	0	0.23219	0.232185	0	0.23219	0.23219	0	0.41462	0.41462
Loam	41.45	1	0.38252	0.996784	2	0.38252	6.83959	2	0.68306	2.53903
Loam/Silt Loam	68.80	0	0.63491	0.634912	4	0.63491	17.83524	4	1.13377	7.24596
Silt Loam	1164.89	12	10.75004	0.145338	7	10.75004	1.30816	17	19.19650	0.25133
Silty Clay/SiCl Loam	97.36	0	0.89847	0.898474	1	0.89847	0.01147	1	1.60442	0.22770
	1517.06	14	14.00000	2.917113	14	14.00000	27.32852	25	25.00000	11.15447
Topography										
Floodplains	1129.90	10	10.42714	0.017497	7	10.42714	1.12642	15	18.61989	0.70374
Upland Crests & Slopes	244.42	2	2.25560	0.028963	6	2.25560	6.21588	7	4.02786	2.19314
Upland Valleys & Slopes	142.74	2	1.31726	0.353868	1	1.31726	0.07641	3	2.35223	0.17838
	1517.06	14	14.00000	0.400330	14	14.00000	7.41871	25	25.00000	3.07526

distant second contributor is a low net density of sites in the well drained category. The distribution of historic sites in relation to the remaining categories is about as expected.

The distribution of prehistoric sites is not significantly different than expected (Chi Square = 4.72 with 3 degrees of freedom) although the patterning in the distribution is largely similar to the historic sites. The well to moderately well drained soils are an exception.

Direct comparisons with work in the Arkansas River Valley are not possible but there is a general similarity between the distribution of sites at Hulah Lake and the results found by Imhoff (1980:8-15--8-16). Ozark Gas corridor sites concentrated on the better drained soils. The same pattern appears to hold at Hulah with the exception of well drained soils where site density is noticeably low. A closer comparison is possible with the results of the investigations in the Salt Creek, Beaver Creek and Little Beaver Creek drainages (Vehik 1985c:308-309). Vehik noted that the permeability of

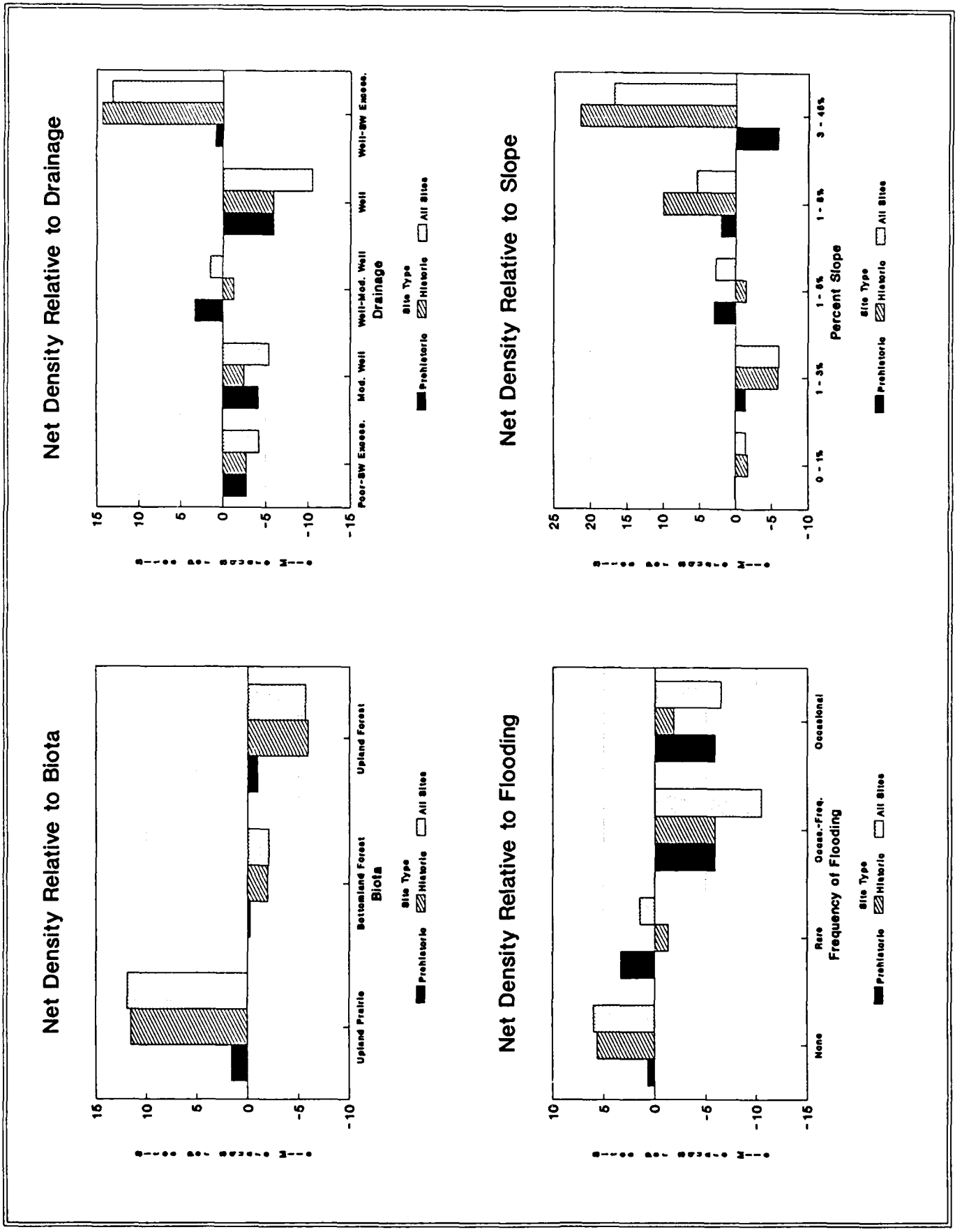

Figure 4. Net site densities relative to environmental attributes.

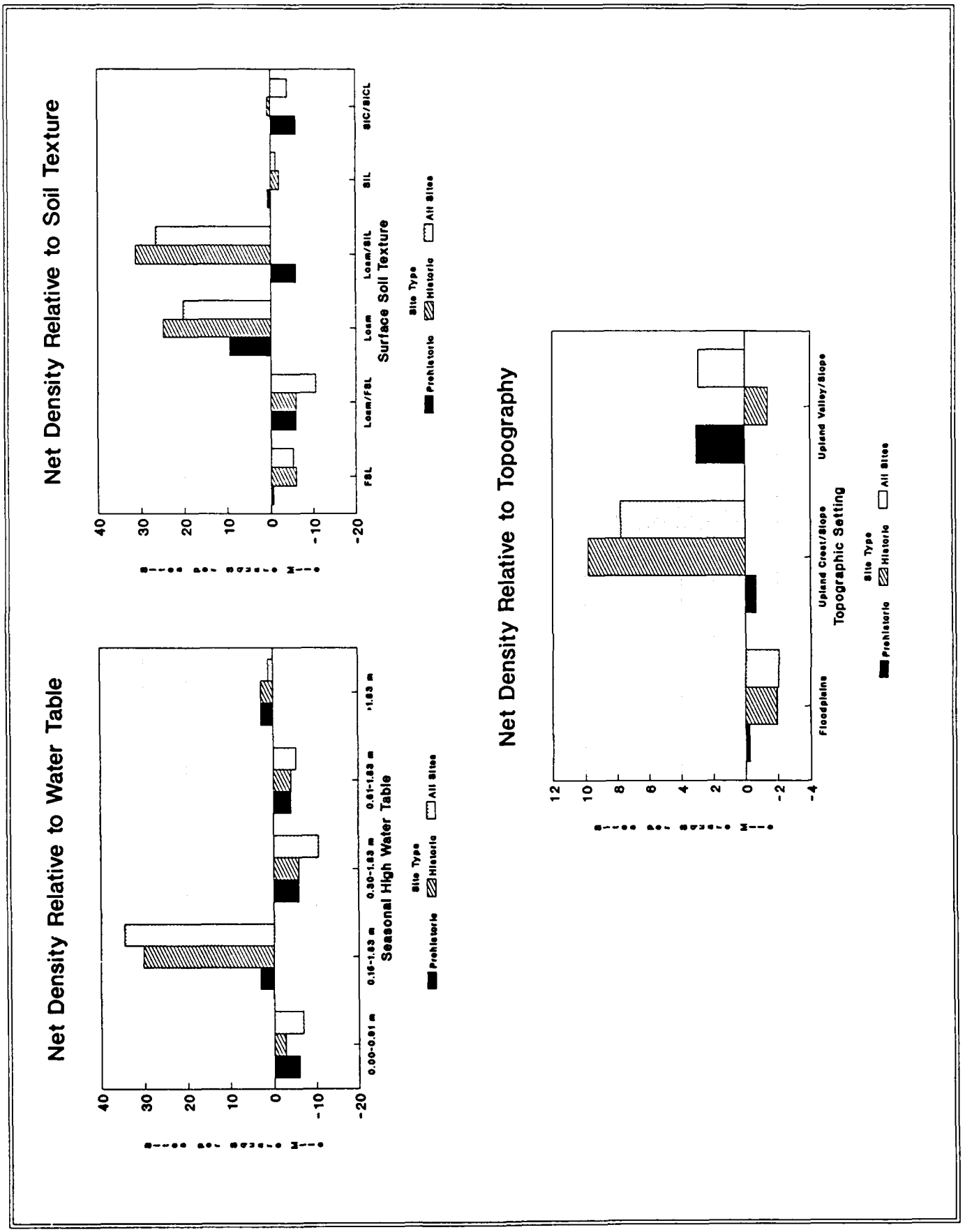

Figure 4. Net site densities . . . (continued)

	Prehistoric Sites				Historic Sites			All Sites		
	Acres	Obs	Exp	Density	Obs	Exp	Density	Obs	Exp	Density
Net Density Relative to Biota										
Upland Prairie	256.55	3	2.36754	1.57776	7	2.36754	11.55632	9	4.22775	11.90504
Bottomland Forest	1129.90	10	10.42714	-0.24194	7	10.42714	-1.94120	15	18.61989	-2.05038
Upland Forest	130.61	1	1.20532	-1.00607	0	1.20532	-5.90616	1	2.15235	-5.64663
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Drainage										
Poor-Somewhat Excessive	203.03	1	1.87364	-2.75391	1	1.87364	-2.75391	2	3.34578	-4.24222
Moderately Well	374.83	1	3.45907	-4.19871	2	3.45907	-2.49127	3	6.17691	-5.42439
Well-Moderately Well	694.03	10	6.40477	3.31534	5	6.40477	-1.29540	13	11.43708	1.44124
Well	55.80	0	0.51494	-5.90616	0	0.51494	-5.90616	0	0.91954	-10.54670
Well-Somewhat Excessive	189.37	2	1.74758	0.85309	6	1.74758	14.37160	7	3.12067	13.11067
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Flooding										
None	387.16	4	3.57286	0.70609	7	3.57286	5.66528	10	6.38010	5.98392
Rare	693.64	10	6.40117	3.32053	5	6.40117	-1.29281	13	11.43066	1.44798
Occasional	121.27	0	1.11913	-5.90616	0	1.11913	-5.90616	0	1.99844	-10.54670
Occasional- Frequent	314.99	0	2.90685	-5.90616	2	2.90685	-1.84253	2	5.19080	-6.48309
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Slope										
0 - 1%	1056.17	10	9.74673	0.15347	7	9.74673	-1.66441	15	17.40488	-1.45726
1 - 3%	142.78	1	1.31763	-1.42374	0	1.31763	-5.90616	1	2.35291	-6.06429
1 - 5%	144.04	2	1.32926	2.98026	1	1.32926	-1.46295	3	2.37367	2.78292
1 - 8%	80.50	1	0.74288	2.04415	2	0.74288	9.99446	2	1.32658	5.35391
3 - 45%	93.57	0	0.86350	-5.90616	4	0.86350	21.45303	4	1.54196	16.81248
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Water Table										
0.00-0.91 m	176.06	0	1.62475	-5.90616	1	1.62475	-2.27103	1	2.90134	-6.91159
0.15-1.83 m	70.81	1	0.65346	3.13211	4	0.65346	30.24692	5	1.16690	34.64464
0.30-1.83 m	25.16	0	0.23219	-5.90616	0	0.23219	-5.90616	0	0.41462	-10.54670
0.61-1.83 m	367.62	1	3.39254	-4.16523	2	3.39254	-2.42430	3	6.05810	-5.32393
over 1.83 m	877.41	12	8.09707	2.84687	7	8.09707	-0.80022	16	14.45905	1.12400
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Soil Texture										
Fine Sandy Loam	119.40	1	1.10187	-0.54602	0	1.10187	-5.90616	1	1.96762	-5.18658
Loam/Fine Sandy Loam	25.16	0	0.23219	-5.90616	0	0.23219	-5.90616	0	0.41462	-10.54670
Loam	41.45	1	0.38252	9.53413	2	0.38252	24.97441	2	0.68306	20.33386
Loam/Silt Loam	68.80	0	0.63491	-5.90616	4	0.63491	31.30314	4	1.13377	26.66258
Silt Loam	1164.89	12	10.75004	0.68674	7	10.75004	-2.06030	17	19.19650	-1.20677
Silty Clay/Silty Clay Loam	97.36	0	0.89847	-5.90616	1	0.89847	0.66738	1	1.60442	-3.97317
	1517.06	14	14.00000		14	14.00000		25	25.00000	
Net Density Relative to Topography										
Floodplains	1129.90	10	10.42714	-0.24194	7	10.42714	-1.94120	15	18.61989	-2.05038
Upland Crests & Slopes	244.42	2	2.25560	-0.66927	6	2.25560	9.80450	7	4.02786	7.78239
Upland Valleys & Slopes	142.74	2	1.31726	3.06119	1	1.31726	-1.42248	3	2.35225	2.90431
	1517.06	14	14.00000		14	14.00000		25	25.00000	

Figure 4. Net site densities . . . (concluded)

floodplain soils, while not the most important, was a factor in the choice in site location. It was shown that the moderately drained Mason silt loam (0% - 1%) accounted for 30% of the site locations while Wynona silty clay loam, also moderately drained, accounted for a greater percentage of the sites (Vehik 1985:308). While no areas of Wynona silty clay loam were present in the survey areas at Hulah, Mason soils were highly preferred with 50% of the sites located there.

Site Distribution and Frequency of Flooding

The overall distribution of sites relative to frequency of flooding is statistically significant to the .05 level (Chi Square = 6.23 with 2 degrees of freedom) due primarily to a low net density of sites on occasionally flooded soils (Table 7 and Figure 4). A secondary contributor to the significance of the distribution is a low net density on occasionally to frequently flooded soils, followed by a high net density of sites on soils that are not subject to flooding. Sites are distributed across rarely flooded soils about as expected.

Historic sites are not distributed differently than expected (Chi Square = 4.996 with 2 degrees of freedom). Flooding does appear to be a factor, but not a critical one, in site selection since net site densities are high on soils that are not subject to flooding but low on soils that are.

The distribution of prehistoric sites is statistically significant relative to flooding (Chi Square = 6.10 @ .05 with 2 degrees of freedom) due to low net densities on soils that are occasionally or occasionally to frequently flooded. A high net density of sites in relation to rarely flooded soils is a secondary contributor. The prehistoric sites are distributed about as expected over soils that are not subject to flooding.

The Hulah results are generally similar to those found in the Ozark Gas (Imhoff 1980:8-14--8-15) corridors where sites were not so much concentrated in places that were not subject to flooding as they were distributed in such as way that locations subject to flooding were avoided. Vehik's (1985c:309) study of sites in parts of Osage and Kay counties noted that floodplain soils that were rarely flooded were most preferred for site location.

Site Distribution and Slope

The overall distribution of sites with regard to percent slope is not statistically significant (Chi Square = 5.54 @ .20 with 3 df) in spite of a fairly high net site density in relation to the 3% - 45% slope category (Table 7 and Figure 4). The distribution of historic sites, on the other hand, is significant beyond the .001 level (Chi Square = 15.69 with 3 degrees of freedom) due to high net densities in the 3% - 45% and 1% - 8% slope categories. A third minor contributor is a low net density in the 1% - 3% category. The distribution in relation to the 0% - 1% and 1% - 5% slope categories is about as expected. The distribution of prehistoric sites is not significantly different than expected with regard to slope (Chi Square = 1.37 with 3 degrees of freedom). While there is a fairly low net density of sites with regard to the 3% - 45% category, the distribution of sites in relation to the remaining categories is about as expected.

The most important aspect of the site distribution here appears to be the difference between the distribution of prehistoric and historic sites in relation to the 3% - 45% slope category. Comparisons with Imhoff's previous work are not possible because of the vastly different categories of slope used

in that study. The results of Vehik's study indicated a prehistoric preference for a low degree of slope. While degree of slope was not directly presented it was alluded to by the location of the majority of prehistoric sites being on the Mason and Wynona soils which tend to have only a very slight slope (Vehik 1985:308). The degree of slope for historic sites is also suggested by Vehik's (1985:328) note that "the presence or absence of structures appears to often be related to the flooding potential." This could suggest that, like the results from Hulah, the historic sites tended to be situated in locations of slightly greater slope.

Site Distribution and
Depth to Seasonal High Water Table

The overall distribution of sites is statistically significant in relation to depth to the water table (Chi Square = 15.96 with 3 degrees of freedom) (Table 7 and Figure 4). The overwhelming factor contributing to the significance of the distribution is a high net density of sites in relation to the 0.15 m - 1.83 m depth category. A second significant contributor is a low net density of sites in the 0.30 m - 1.83 m depth category. Low net densities in the 0.00 m - 0.91 m and 0.61 m - 1.83 m categories also contributed to a minor extent. The distribution of sites with regard to the greater than 1.83 m category is about as expected.

The distribution of historic sites is also statistically significant (Chi Square = 18.33 with 3 degrees of freedom) and is the largest factor in the significance of the overall distribution. The overwhelming contributor is the high net density of sites in the 0.15 m - 1.83 m depth category. A low net density in the 0.30 m - 1.83 m category contributes to only a minor extent, while the distribution is about as expected with regard to the remaining categories.

The distribution of prehistoric sites is not significant with regard to depth to seasonal high water table (Chi Square = 5.61 with 3 degrees of freedom). Although there are moderately low net densities in relation to the 0.00m - 0.91 m, 0.30 m - 1.83 m and 0.61 m - 1.83 m categories, site densities over the remaining two categories are only slightly greater than expected.

With the exception of the greater than 1.83 m category, the patterning in the two distributions is similar. Due to a lack of information, no direct comparisons can be made with the other two investigations though with the similarities in the soils between Hulah and the Beaver and Salt Creek surveys similar results might be implied.

Site Distribution and Surface Soil Texture

The distribution of all sites in the area is statistically significant relative to surface soil texture (Table 7, Figure 4). The Chi Square statistic (11.15) is significant at the .02 level with four degrees of freedom. The primary factors are a high net density of sites in the loam/silt loam and loam categories. Low net densities in the loam/fine sandy loam and fine sandy loam also contribute, but to a much smaller extent. The distribution of sites across silt loams is about as expected.

It is clear that the distribution of historic sites is the greatest factor in the significance of the overall distribution. The Chi Square (27.33) value observed is significant at the .001 level and once again high net densities of sites in relation to the loam/silt loam and loam categories

are largely responsible. Low net densities in the fine sandy loam and loam/fine sandy loam categories also contribute to a minor extent. The distribution of historic sites across the silt loam and silty clay/silty clay loam categories is about as expected.

Prehistoric site distribution is not significantly different than expected with regard to soil texture (Chi Square = 2.92). While the net density is greater than expected in relation to the loam category and slightly less than expected in relation to all but the silt loam category, the differences are not statistically significant and indicate that the prehistoric sites are distributed without regard to soil texture.

A comparison of the two categories indicates that the patterning (i.e., positive vs. negative net densities) is similar with regard to the more coarsely textured soils but diverges as the texture becomes finer. While the Beaver and Salt Creek investigations did not use soil texture in the analysis the similarity of the soils suggest similarities in the site distribution with the possible exception of the silty clay loam of the Wynona soil. This is in marked contrast to the distribution of sites found in the Texas Eastern project corridor in the Mississippi lowlands by Imhoff (1982:112, 114-117) where prehistoric and historic sites were distributed preferentially on the coarser, better drained soils. A similar study conducted along the Ozark Gas corridor (Imhoff 1980:8-17--8-18) produced results similar to the site distribution at Hulah Lake in that the highest density of sites is associated with loamy soils. The Hulah and Ozark Gas projects included both upland and lowland areas and it seems likely that the differences between these projects and the Texas Eastern project can be attributed to fundamental differences between a wholly lowland environment, where coarser soils are associated with differences in the habitability of a given location and a mixed upland/lowland environment, where soil texture is probably important for its association with differing exploitable resources. The loamy soils at Hulah tend to be associated with upland prairie environments.

Site Distribution and Topography

The overall distribution of sites is not statistically significant with regard to topography (Chi Square = 3.08 with 1 degree of freedom) (Table 7 and Figure 4). Although there is a fairly high net density of sites on upland crests and slopes, the remaining densities are about as expected.

Historic site distribution is significant (Chi Square = 7.42 with 1 degree of freedom) at the .01 level because of a high net density of sites on upland crests and slopes. The distribution in relation to the remaining categories is about as expected.

The distribution of prehistoric sites is not significant in relation to topography (Chi Square = 0.40 with 1 degree of freedom). The density of sites in relation to upland valleys and slopes is only slightly greater than expected and the distribution over the remaining two categories is almost uniform. The lack of data on site distribution in regard to topography in the other investigations precludes useful comparisons.

Conclusions Regarding Site Distribution at Hulah Lake

Our sample of project lands at Hulah Lake resulted in the discovery of 25 archeological sites. Based on an average density of 10.55 sites per square

mile, we estimate that approximately 341 archeological sites exist on the 32.31 square miles (20,676 acres) of government owned lands in the project area.

The following section will discuss those environmental attributes with which sites tend to be associated and those where sites are noticeably absent, but first a few general points should be made. The graphs presented are intended to point to environmental attributes exhibiting site densities that are greater or less than expected. It should be kept in mind that a value at or near zero indicates a density that is as expected rather than an absence of sites. The 13 sites on Mason soils are only slightly greater than the 11.4 sites that could be expected, given the acreage encompassed by these soils. In comparison, while Mason silt loam (0% - 1%) accounted for 11.4% of the soils in the Beaver Creek and Salt Creek areas where it accounted for 30% of the sites.

Prehistoric Sites

The distribution of prehistoric sites in the areas investigated is surprisingly uniform. This is particularly true in relation to biotic communities, slope and topography. The distribution in relation to drainage and depth to the water table may be a factor in site location, but the net densities make little sense and are difficult to interpret. Site location in the Texas Eastern survey was very sensitive to drainage and depth to the water table (both factors affecting the wetness of a given location and thereby its suitability for occupation), with net site density increasing with better drainage and deeper seasonal water tables. This does not seem to hold true at Hulah.

Frequency of flooding is the only attribute that appears to be important in the distribution of prehistoric sites. Prehistoric sites are situated to avoid the more frequently flooded areas rather than clustering in places that are not subject to flooding. Similar relations were observed in the investigations of Beaver Creek and Salt Creek where sites were primarily associated with rarely flooded soils (Vehik 1985:308). The higher net density of sites on rarely flooded soils, as opposed to those that are not subject to flooding, probably reflects the importance of remaining near water while minimizing the danger from flooding.

Historic Sites

The distribution of historic sites is statistically significant in relation to all of the environmental attributes except flooding (although the net densities do appear to decrease as the frequency of flooding increases). Noticeably high net densities of sites occur in relation to the upland prairie biotic community, well to somewhat excessively drained soils, 1% - 8% and 3% - 45% slopes, water tables in the 0.15 m - 1.83 m category, the loam and loam/silt loam surface texture categories and upland crests and slopes.

Table 8 presents soils exhibiting one or more of these attributes and clearly shows that two soils -- Coweta-Bates complex and Steedman-Coweta complex, 15% - 25% slopes -- largely account for the significance of the distribution of historic sites. These soils account for only 4.3% of the acreage surveyed but 42.9% of the sites recorded. In contrast the Mason silt loams with 0% - 1% slopes account for 35.7% of the sites but encompasses 40.9%

Table 8
Soils exhibiting one or more high density variables

No. Variables	Soil	Acres	No. Sites Obs	No. Sites Exp	Sites/Sq. Mi. Obs.	Sites/Sq. Mi. Net
1	Dennis-Carytown cpx	66.76	1	0.616	9.587	3.681
1	Prue loam, 3-5%	7.01	0	0.065	0.000	-5.934
2	Dennis silt loam, 1-3%	35.37	0	0.326	0.000	-5.899
2	Dennis silt loam, 3-5%	16.87	0	0.156	0.000	-5.918
2	Niotaze-Darnell cpx, 3-15%	24.16	0	0.223	0.000	-5.907
2	Niotaze-Darnell cpx, 15-25%	1	0	0.009	0.000	-5.760
2	Norge silt loam, 1-3%	11.96	0	0.110	0.000	-5.886
2	Norge silt loam, 3-5%	10.96	0	0.101	0.000	-5.898
2	Parsons silt loam, 1-3%	1.81	0	0.017	0.000	-6.011
2	Parsons-Carytown cpx	1.98	0	0.018	0.000	-5.818
2	Steedman silt loam, 3-5%	0.59	0	0.005	0.000	-5.424
2	Stephenville-Darnell cpx	40.85	0	0.377	0.000	-5.906
3	Bates loam	18.93	0	0.175	0.000	-5.917
3	Darnell-Stephenville cpx	64.6	0	0.596	0.000	-5.905
4	Norge, Dennis & Prue soils	0.39	0	0.004	0.000	-6.564
5	Coweta-Bates cpx	15.51	2	0.143	82.527	76.627
6	Steedman-Coweta cpx, 15-25%	49.77	4	0.459	51.437	45.534
6	Steedman-Coweta cpx, 3-15%	18.64	0	0.172	0.000	-5.906

of the acreage surveyed. It appears that the presence of one or two high density variables is fairly meaningless but that where most or all of them occur in combination historic sites are likely to occur.

Discussion

The results obtained contrast markedly with the Texas Eastern study (Imhoff 1982) where the distribution of prehistoric sites was found to be much more selective than historic sites. These differences were attributed to flooding and drainage conditions that made large parts of the environment uninhabitable much of the year. In the Hulah Lake area, the environment is less uniform than in the Mississippi Valley but does not place long-term restrictions on the habitability of large parts of the environment. This would have been particularly true of peoples living a hunting and gathering lifeway that exploited the full range of resources available in the immediate vicinity. In contrast, the high density of historic sites on upland crests and slopes accompanied by a somewhat low density on floodplains may reflect the reservation of the latter areas for agricultural purposes. It may also be important that (except in three instances) prehistoric and historic sites occur exclusive of each other.

The development of a clearly workable model of site distribution cannot be predicated on the basis of 25 sites. While we have been able to garner a general glimpse of how sites are distributed in the Hulah Lake area, there is too much temporal and functional variability between them to enable the development of a viable model. This is particularly true when one realizes that the placement of industrial sites, such as oil drilling pads, has little to do with the surface environment. The situation is also vexing where prehistoric sites are concerned because of their uniform distribution throughout the survey areas. There is simply no place in the project area that can be pointed to as more or less likely to contain prehistoric sites than another.

RECOMMENDATIONS

In our opinion that only five of the recorded sites require additional attention in order to assess their potential eligibility for the National

Register of Historic Places. All are prehistoric sites. None of the historic components appears to meet minimum requirements of significance. 340s-29 exhibits the results of possible Archaic Period activities. 340s-523 has a probable Woodland Period component. 340s-530 contains evidence of the Caddo Period with primary use during the Spiro Phase. 340s-533 contains information relating to the Village Period. 340s-534 was used prehistorically but we cannot be certain during what time periods.

Each of these sites should be investigated by a series of techniques including controlled 50 cm x 50 cm and 1 m x 1 m test units, shovel and deep posthole tests and intensive surface collections. A minimum of four square meters should be excavated at each.

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CONTRACT NO. DACW56-85-D-0024
DELIVERY ORDER NO. 0005
ARCHAEOLOGICAL SURVEY/EVALUATION
HULAH LAKE

PHASE 1

SCOPE OF WORK

1. General.

a. The investigation described herein shall be accomplished in two (2) phases. Phase 1 will include survey, testing, and preliminary evaluation of cultural resources within the shoreline and near shore zones of the project. Phase 2, to be executed at the Government's option, will consist of survey, testing, and preliminary evaluation of cultural resources throughout the project, above the shoreline. Phase 1 will constitute about 40% of the total work effort; Phase 2 will represent approximately 60% of the total work effort. The decision to execute Phase 2 will be based upon the results of the Phase 1 survey.

b. This scope of work and Delivery Order apply only to Phase 1.

c. Hulah Lake is located on the Caney River in the upper reaches of the Osage Hills. The dam is located at river mile 96.2, which is approximately two (2) miles west of Hulah, Oklahoma. The lake lies primarily in Osage County, Oklahoma, but in three locations extends into Chautauqua County, Kansas. At conservation pool elevation, 733 MSL, the lake has approximately 62 miles of shoreline; at flood pool elevation, 765 MSL, there are some 75 miles of shoreline. The upstream watershed is approximately 732 square miles. Project lands total 20,676 acres.

d. In order to meet its obligations under Federal law and regulations, the Corps of Engineers, Tulsa District, will contract for cultural resources survey and evaluation of Hulah Lake and for preparation of long range management recommendations at the project.

e. The investigations required by this scope of work include field examination and preliminary testing/evaluation of a representative sample of the project shoreline and near shore zone, which is affected by the fluctuating lake level. Particular attention shall be paid to the effects of near shore erosion on cultural resources, especially in the area between the top of the normal power pool and the top of flood pool. This investigation shall consider both prehistoric and historic cultural resources.

f. Within the overall parameters of 1 e. above, the Contractor shall determine appropriate sampling strategies and fractions and shall specify same in his proposal.

2. Archaeological Background. An archaeological survey of the Hulah Lake area was conducted in 1947 by Charles E. Smith and David J. Wenner. Only four (4) sites were recorded; all are of indefinite cultural affiliation. Several additional sites have been discovered since construction of the project, as the result of land disturbing activities. No surveys have been conducted since project construction was completed.

3. Services. The Contractor shall perform all work required to provide the following services and products:

a. Sample survey of the shoreline and near shore areas as described in 1 e. above.

b. Shovel testing where required by reduced surface visibility in order to maintain a satisfactory sampling strategy as stated in the Contractor's proposal and as accepted by the Government.

c. Preliminary (not National Register level) evaluation of sites located during survey, to estimate number of sites that require mitigation or further investigation.

e. Predictive model of site occurrence throughout the project, to be used as the basis for evaluating project impacts, planning future archaeological investigations, estimating mitigation time and costs, and to serve as the basis for a long range management plan for the preservation of cultural resources. The preliminary predictive model will form the basis for planning the sampling strategy in Phase 2, in the event the Government opts to accomplish the latter phase.

f. Formal (not letter) report of investigations as described in the basic contract (6.c. and following), which shall include recommendations for overall management of cultural resources at the project. The Tulsa District's management philosophy is that excavation will generally be used only as a last resort; where preservation in place is feasible, that is the preferred course of action.

4. Government Furnished Materials

a. USGS quads for the project area.

b. Pertinent project data.

c. Reports of previous archaeological investigations at the project if available.

d. Temporary laboratory/storage space at the Government's facilities at 5912 East 12th Street, Tulsa, if available.

5. Presentation of Data.

a. Specific site locations shall be delineated on the USGS quads provided.

b. All other data shall be provided in a publishable quality, formal report as specified in Contract No. DACW56-85-0024.

6. Other Provisions. All provisions of the above referenced contract apply to this Delivery Order.

7. Schedule of Services. The field work required herein shall be completed within 120 days of the date of this Delivery Order. A draft report shall be completed within 180 days of the above date, and the final report shall be submitted within 45 days of receipt by the Contractor of the Government's comments on the draft.

8. Project Manager. The Government's Project Manager for this Delivery Order will be Mr. Michael Corkran, Environmental Resources Branch (telephone 918-581-7864).

CONTRACT NO. DACW56-85-D-0024
DELIVERY ORDER NO. 0007
ARCHAEOLOGICAL SURVEY/EVALUATION
HULAH LAKE

PHASE 2

SCOPE OF WORK

1. General.

a. The investigation described herein shall be accomplished in two (2) phases. Phase 1 will include survey, testing, and preliminary evaluation of cultural resources within the shoreline and near shore zones of the project. Phase 2, to be executed at the Government's option, will consist of survey, testing, and preliminary evaluation of cultural resources throughout the project, above the shoreline. Phase 1 will constitute about 40% of the total work effort; Phase 2 will represent approximately 60% of the total work effort. The decision to execute Phase 2 will be based upon the results of the Phase 1 survey.

b. This scope of work and Delivery Order apply only to Phase 2.

c. Hulah Lake is located on the Caney River in the upper reaches of the Osage Hills. The dam is located at river mile 96.2, which is approximately two (2) miles west of Hulah, Oklahoma. The lake lies primarily in Osage County, Oklahoma, but in three locations extends into Chautauqua County, Kansas. At conservation pool elevation, 733 MSL, the lake has approximately 62 miles of shoreline; at flood pool elevation, 765 MSL, there are some 75 miles of shoreline. The upstream watershed is approximately 732 square miles. Project lands total 20,676 acres.

d. In order to meet its obligations under Federal law and regulations, the Corps of Engineers, Tulsa District, will contract for cultural resources survey and evaluation of Hulah Lake and for preparation of long range management recommendations at the project.

e. The investigations required by this scope of work include field examination and preliminary testing/evaluation of a representative sample of project lands. This investigation shall consider both prehistoric and historic cultural resources.

f. Within the overall parameters of 1 e. above, the Contractor shall determine appropriate sampling strategies and fractions and shall specify same in his proposal.

2. Archaeological Background. An archaeological survey of the Hulah Lake area was conducted in 1947 by Charles E. Smith and David J. Wenner. Only four (4) sites were recorded; all are of indefinite cultural affiliation. Several additional sites have been discovered since construction of the project, as the result of land disturbing activities. No surveys have been conducted

since project construction was completed.

3. Services. The Contractor shall perform all work required to provide the following services and products:

a. Sample survey of the shoreline and near shore areas as described in 1 e. above.

b. Shovel testing where required by reduced surface visibility in order to maintain a satisfactory sampling strategy as stated in the Contractor's proposal and as accepted by the Government.

c. Preliminary (not National Register level) evaluation of sites located during survey, to estimate number of sites that require mitigation or further investigation.

e. Predictive model of site occurrence throughout the project, to be used as the basis for evaluating project impacts, planning future archaeological investigations, estimating mitigation time and costs, and to serve as the basis for a long range management plan for the preservation of cultural resources.

f. Formal (not letter) report of investigations as described in the basic contract (6.c. and following), which shall include recommendations for overall management of cultural resources at the project. The Tulsa District's management philosophy is that excavation will generally be used only as a last resort; where preservation in place is feasible, that is the preferred course of action.

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5. Presentation of Data.

a. Specific site locations shall be delineated on the USGS quads provided.

b. All other data shall be provided in a publishable quality, formal report as specified in Contract No. DACW56-85-0024.

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8. Project Manager. The Government's Project Manager for this Delivery Order will be Mr. Michael Corkran, Environmental Resources Branch (telephone 918-581-7864).

APPENDIX A
Project Participants

DAVID B. BOARD conducted the field work and assisted in the preparation of the report. Mr. Board received a B.A. in anthropology from the University of Tennessee in 1986.

STEVEN M. IMHOFF received a B.S. in sociology from the University of Tulsa in 1974 and an M.A. in anthropology from the University of Arkansas in 1982. He is a member of the Society of Professional Archeologists. Mr. Imhoff conducted the 16 November fieldwork and wrote portions of the technical report.

TIMOTHY C. KLINGER served as Principal Investigator and wrote various sections of the report. Mr. Klinger received an M.A. in anthropology from the University of Arkansas in 1977 and a J.D. from the University of Arkansas School of Law in 1982. Mr. Klinger is a member of the Society of Professional Archeologists and is a licensed attorney in the State of Arkansas.